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The Cost of Comfort

A FEATURE of the new Flying Scotsman trains of the L.N.E.R. is the very considerable increase in the weight of the coaches that has been brought about by various additions to passenger comfort. Among these may be mentioned the forced-ventilation apparatus now fitted to each coach, instead of to the first class vehicles only; acoustic blankets and double windows for reduction in noise; and a buffet car in addition to restaurant cars for variety in refreshments. The result is that 42-seater third class coaches, previously averaging in weight 32 tons, have increased to 37¼ tons; a composite coach, 66 ft. 6 in. long, previously 34½ tons, is now 39 tons; the triplet restaurant car set, 85 tons in weight on the previous Flying Scotsman, is now 92¾ tons. Passenger accommodation equal to that given by twelve coaches in the new 426-ton train was given previously by eleven coaches weighing about 343 tons, so that the new amenities add almost exactly 25 per cent. to the demands on locomotive power. But it is on the winter working, when all the intermediate stops are reinstated, and two daily services are merged into one, that the problem of haulage will become really severe. Last winter 15-coach trains and 500-ton gross loads were common on this service; in future loads nearer 600 tons will often be necessary if the same accommodation is to be provided, and must be worked south of York on 60-m.p.h. schedules. A letter on p. 286 in this issue, points out that the problem would be considerably eased if the timings of these and other East Coast expresses could be adjusted to a common standard of speed relatively to gradients throughout their journeys.

* * * *

A New Holiday Camp Scheme

A new company has just been registered under the title of British Holiday Estates Limited, with a capital of £250,000, for the purpose of developing holiday camp centres in Great Britain. The capital has been subscribed equally by the L.M.S.R. and Thos. Cook & Son Ltd., and the Chairman is Mr. Stanley Adams, Managing Director of Thos. Cook & Son Ltd. The other directors are Mr. Ashton Davies, acting Vice-President of the L.M.S.R.; Mr. Herbert E. Griffin, Managing Director of Thos. Cook & Son (Bankers) Ltd.; and Mr. Arthur Towle, Controller of L.M.S. Hotel Services. An extensive site for the first camp has been chosen adjoining the beach at Prestatyn in North Wales. This situation is recommended not only by its holiday amenities, but because of its easy access by fast L.M.S.R. trains. For example, The Welshman, non-stop from London, takes only 3 hr. 50 min. to Prestatyn, while Manchester and Liverpool are only an hour and a half distant, and Birmingham two and a half hours away. The camp will be ready by the spring of next year. Its attractions will include a heated swimming bath, a large number of tennis courts, croquet lawns, bowling greens and accommodation for table tennis, dancing and entertainments. Accommodation will be provided for upwards of 2,000 people.

* * * *

The Week's Traffics

Coal contributed £63,500, merchandise £121,500 and passenger train traffic £55,000 to the total decrease in receipts of £240,000 shown by the four main-line railways for the past working week. These traffics, as in the week of 1937 with which the comparisons are made, all include the Bank Holiday Monday—and on the L.N.E.R. take in the Sunday as well. Aggregate takings for the 31 weeks are £2,833,000 behind their level a year ago. The only advances for the week are shown by the L.N.E.R. with an increase of £13,000 in passenger train receipts and the Southern with an increase of £1,500 in coal.

	31st Week				Year to date	
	Pass., &c.	Goods, &c.	Coal, &c.	Total	Inc. or Dec.	
	£	£	£	£	£	%
L.M.S.R. ..	– 28,000	– 74,000	– 16,000	– 118,000	– 1,183,000	– 3·02
L.N.E.R. ..	+ 13,000	– 17,000	– 31,000	– 35,000	– 971,000	– 3·40
G.W.R. ..	– 17,000	– 29,000	– 18,000	– 64,000	– 536,000	– 3·28
S.R. ..	– 23,000	– 1,500	+ 1,500	– 23,000	– 143,000	– 1·09

London Transport receipts fell £600 on the week but are up £34,100 on the six weeks.

* * * *

Easier Journeys by Air

The linking of the interests of Railway Air Services and Channel Air Ferries by the formation of the new company announced last week, has already brought additional facilities to air travellers. Since August 8 improved connections have obtained between Brighton and the Scilly Isles, provided by re-timing the lines previously worked independently between Brighton and Cardiff by Channel Air Ferries; between Cardiff and Plymouth by Railway Air Services; and again by Channel Air Ferries from Plymouth to the Scillies. A simple adjustment of timetables, on the lines recommended in the report of the Cadman Committee on Civil Aviation, has thus given concrete and useful existence to a new air link which previously was a link only on the map, for although there was a connection (involving a wait of 55 min. at Cardiff) between Brighton and Plymouth, the latter airport was not reached until 45 min. after the departure of the

machine for the Scillies. Also on August 8, Jersey Airways—already a railway-associate—began a service between Southampton and Dinard, connecting at Southampton with the Railway Air Services machine from Cardiff and Bristol. Now a passenger from Manchester by Railway Air Services, by changing at Bristol and Southampton, can travel to Dinard between 8.55 a.m. and 2.0 p.m. using R.A.S. or associated machines throughout.

* * * *

Overseas Railway Traffics

The gain of £434 on the aggregate which the Buenos Ayres Great Southern—alone of the four principal Argentine systems—showed in the fourth week has been slightly improved. Good takings in the fifth week actually brought its lead over 1937 up to £2,792, but unfortunately that advantage has not been maintained. The Pacific, Western, and Central Argentine companies have recorded decreases throughout the fortnight, but the Argentine North-Eastern, with improvements of £781 and £2,134 respectively in the two weeks, is £6,321 ahead of its position at this time last year. The Central Uruguay has increased its lead over 1937 by £1,916 compared with a fortnight ago.

	No. of Week	Weekly Traffics	Inc. or Decrease	Aggregate Traffic	Inc. or Decrease
		£	£	£	£
Buenos Ayres & Pacific ..	6th	75,993	– 6,017	330,820	– 56,389
Buenos Ayres Great Southern ..	6th	122,581	– 2,109	663,028	+ 683
Buenos Ayres Western	6th	35,422	– 5,707	201,922	– 40,758
Central Argentine	6th	102,993	– 23,440	549,771	– 246,472
Canadian Pacific	31st	750,800	– 58,400	14,475,630	–1,290,800
Bombay, Baroda & Central India	18th	211,650	+ 10,725	3,025,050	– 61,950

The B.B. & C.I. has reduced its setback from 1937 by £1,175 in the fortnight.

* * * *

"It's Cooler Underground"

The notice quoted above must have attracted many travellers lately to the London Underground stations at which it is being displayed. London Transport is making a special study of temperatures in the tubes, and it has been found that they are often much below surface shade temperatures, the difference sometimes amounting to ten degrees. In addition to being cooler, air in the tubes is drier, is scientifically ventilated, and is in constant movement. This special study is being made to assist the engineers to prepare plans for additional ventilation when heavier services begin next year as a result of the £40,000,000 extension scheme. Preliminary plans are being discussed which would cost about £500,000 and would include the installation of 30 more ventilating plants, bringing the total to more than 100. At Tottenham Court Road, on the Northern Line southbound platform, a plant is being installed which will give an effect equivalent to melting 50 tons of ice a day on the platform, and should be in operation in September. The effect will be achieved by blowing air over pipes containing water just above freezing point. At Trafalgar Square the engineers have just concluded, on a small scale, an experiment by which a belt of chilled air was created by blowing invisible water vapour across the mouth of the tunnel. The engineers are now seeing whether this device can be used on a large scale.

* * * *

A Railway Lending Library

An unusual lending library is to be found in the waiting room of Garsdale station (Yorkshire) on the main L.M.S.R. line between Leeds, Carlisle, and Scotland. Its only patrons are the railwaymen stationed at this lonely spot in the mountains, and their families. *Ex-officio* librarian is the stationmaster, Mr. J. F. Ferguson, who has the custody of the 150 books comprising the collection; many are of the Victorian "improving" kind, but latterly modern fiction has been added. Explanation of this curiosity is that the library was bequeathed to the station staff some forty years ago by two old ladies who lived nearby, and who took pity on the lonely situation of the railwaymen. Garsdale is the highest main-line junction on the L.M.S.R. in England, and the neighbouring signal box of Ais Gill is no fewer than 1,169 ft. above sea level. The principal patronage of the library consists of four porters and six signalmen, and members of the engineering staff and their families. They claim that Garsdale is England's windiest station, and point out that the turntable is surrounded by a protective wooden fence installed after a terrific gale had caused an engine to be blown round on the turntable nearly all night, until the staff brought it to a stop by throwing quantities of ballast into the pit. There is only one small shop near the station, and, in view of the limited facilities, the L.M.S.R. grants a free pass every week to the railwaymen's wives to enable them to visit the markets at Hawes, six miles away, or Settle, twenty miles away.

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The Ditton Priors Light Railway

The Great Western Railway has just announced that, owing to lack of use, the passenger train service between Cleobury Mortimer and Ditton Priors is to be withdrawn from Monday, September 26, and the following platforms closed to passengers: Cleobury Town halt, Detton Ford siding, Prescott siding, Stottesdon halt, Aston Botterell siding, Burwarton halt, Cleobury North crossing, and Ditton Priors halt. One goods train will continue to run in each direction on weekdays only, carrying parcels traffic, minerals, and livestock to and from these points. This line was authorised under the Cleobury Mortimer & Ditton Priors Light Railway Order of 1901. It was opened for goods traffic on July 1, 1908, and for passenger traffic on November 19, 1909; its absorption into the G.W.R. took place as from the first day of 1922 under a preliminary absorption scheme dated May 9, 1922. Ditton Priors itself is in a comparatively remote part of Shropshire isolated from any other railway communication, and the light railway makes contact with the main railway system at Cleobury Mortimer junction station, a point between Bewdley and Tenbury Wells.

* * * *

A Survey of Synthetics

Ages ago alchemists devoted their lives to the search for methods of transmuting the baser metals into gold. Nowadays, a more prosaic if equally earnest generation continues the search, not now for gold but for a less romantic form of wealth, and accumulated knowledge and experience are being applied by our chemists to the transmutation of raw materials into finished products which bear not the remotest resemblance to their original form. Black coal into colourful dyes; and even stranger still, coal into saccharine. Then, almost, as it were, by a reversal of ideas, molasses into carbon dioxide gas, or "dry ice," used for refrigeration. To the layman there is a sense almost of wizardry in these transmutations, and yet the harnessing of science to the service of man has long since achieved the greatest wonder of all, namely a machine which being fed with coal does man's work for him and seems almost alive—the steam engine. These reflections have been prompted by the persusal of the Survey, compiled by the City Analyst of Hull, and reviewed in our columns this week, of the industries for which conditions in that city are suitable. The descriptions in the Survey of recent progress in what might be called the science of transmutation, are illuminating and intensely interesting.

Moving the Euston Doric Arch

In connection with the rebuilding of Euston station now projected, there has been much discussion as to what should be done with Hardwick's famous Doric arch, the site of which is required for the new station buildings. One proposal was to do away with it altogether, but another was to move it to form the centre-piece in the new entrance from Euston Road. If the latter course were followed it would either have to be dismantled and rebuilt at the new site, or moved bodily by rolling to the Euston Road. Some idea of what can be achieved in the matter of rolling massive structures from place to place is given in our American contemporary, the *Engineering News Record*, dated July 21, which describes the moving and skewing of a nine-storey building at Hartford, Connecticut, weighing 8,000 tons, to a new site 112 ft. from its original position. This building measured 83 ft. × 140 ft. and was of the steel frame and brick curtain-wall type. The actual moving took two days, and it is interesting to note that during this time and the period of preparation for moving, business went on as usual in the building; the lifts continued to function and water, drainage, gas, and electric services were maintained. Details of the method adopted are outlined in the note below.

* * * *

How a Nine-storey Building was Moved

The nine-storied building described above was moved as follows. The new foundations, basement, and concrete piers were prepared, and the 28 steel supporting columns at the base of the building were stripped of all covering, and the outside concrete walls were removed. A rigid steel carrying frame weighing 300 tons was riveted to the 28 columns, and under it powerful jacks were placed and the whole structure was raised $\frac{3}{4}$ in. Timber cribbing was erected on the concrete floor, and on it were laid tracks of 80-lb. flat-bottom rails. Then, 1,600 3-in. cold rolled steel rollers were inserted between the rails and the under side of the longitudinal members of the carrying frame; the load was transferred to the rails by driving steel shims and releasing the jacks. The cribbing and rail tracks extended throughout the length to be moved, and the motive power consisted of two three-drum steam hoists to which were attached three sets of $\frac{5}{8}$-in. steel cable, each set consisting of 18 parts, so that a total of 54 parts was used in the move. The unusual feature of the work was the skew imparted to the structure during the move, so that the south-east corner was moved laterally 9 in. and the north-east corner 3 ft. This was achieved by setting the rollers at a pre-determined angle, so that at the end of the move the building was exactly on its altered alignment.

* * * *

Dismantling Railway Lines

Although the great majority of railway lines which have been closed to passenger traffic during recent years have remained open for the conveyance of goods, there are a number of instances in which lines have been abandoned entirely. In some such cases the abandonment includes provision for their immediate dismantling and the realisation of the properties, such as was carried out when the Lynton & Barnstaple Railway was closed. On the other hand, short sections of line situated in comparatively inaccessible locations in relation to markets for the material realised, are often left untouched until a favourable moment occurs and then the actual demolition passes almost unnoticed. In a recent issue of *The Railway Observer*, the organ of the Railway Correspondence and Travel Society, reference is made to quite a number of demolitions both in this country and in Eire. For example, it is recorded that the track of the old Solway Junction Railway from Bowness to Kirkbridge and from Abbey Junction to Brayton Junction has lately been lifted and most of the bridges over roads, streams, &c., demolished. The track of the L.N.E.R. Port Carlisle branch has also been removed recently. It is stated that in Eire all the track on the Galway—Clifden branch has been lifted, and the dismantling of the large bridge over the River Correb at Galway is now proceeding. Four miles of track have been lifted at the Achill end of the Westport—Achill branch. All track has been lifted on the Ballina—Killala section, though the railway buildings and locomotive shed at Killala are still extant and have been sold. Similar remarks apply to the Kinsale branch, except that the engine shed is nearly demolished. All the Irish lines concerned are parts of the Great Southern system.

* * * *

Streamlining in India

Mr. C. Pearce, of the East Indian Railway, remarked during the discussion of a paper by Mr. H. J. Nichols entitled " The Development of Passenger Rolling Stock," read at a meeting of the Institution of Locomotive Engineers at Delhi, that investigations had been made on that railway into the possibilities of streamlined trains. One of the fast trains running between Howrah and Delhi, a distance of 890 miles, was subjected to analysis from the point of view of speeds obtained and fuel consumption per annum, per stock. The train under analysis ran at 50 m.p.h. only for about 38 per cent. of the total time, and as streamlining had been considered, after certain trials, to be uneconomic below 60 m.p.h., attention was given to a reduction in the weight of the rolling stock. Experiments made by the L.M.S.R. Research Department indicated that a 12-coach train travelling at 60 m.p.h. in still air absorbed 433 h.p., but if of streamlined design it required only 283 h.p. It had therefore been decided on the East Indian Railway that attention should be given not only to the question of reduction in weight by a change of design, but to the introduction of stock lending itself to modified streamlining. Air-conditioning was also to be considered. If, however, from the tenders submitted it was found that the reduction in weight was not economic, the matter would be dropped.

* * * *

Excursions and Alarums

During the recent holiday period the B.B.C. goaded a thousand or so infuriated Southend excursionists into belligerence by announcing a non-existent return service to London—a genuine " ghost-train," in fact. The *Daily Telegraph* only reported this, and then, in describing, a paragraph ahead, a mishap near London to a return excursion from Littlehampton, led us to believe that after a 20 minutes' relay (*sic*) passengers were able to proceed to their destination. *Prima facie* it would appear from the foregoing that Broadcasting House was determined to make the *amende honorable* for its previous non-technical hitch; anticipating, as it were, a song and dance from the marooned travellers, it decided, most astutely, to get in first, and we should be interested to know the exact nature of their ethereal *solatium*. In our opinion, Honegger's " Pacific 231 " would have been a most unwise selection, whilst the inclusion of such numbers as " where my caravan has rested," " we shan't be home till morning " must have resulted in a Battle of Waterloo (1938 edition), compared with which the Southend incident would have been a mere tavern brawl. Therefore we eagerly await further enlightenment.

XUM

Beira and Rhodesia Railways

A TOTAL length of 2,708¾ miles on the 3 ft. 6 in. gauge is included in this system, of which 197½ miles are in Moçambique (Portuguese) territory, 112 miles in the Cape Province, and 398½ miles in the Bechuanaland Protectorate. The 588½ miles extending from Vryburg to Bulawayo, including the Matapos branch, although owned by Rhodesia Railways Limited, are operated by the South African Railways, and the remaining 2,120¼ miles, though belonging to three separate companies, namely, Rhodesia Railways Limited (1,853¾ miles), Beira Railway Co. Ltd. (203¾ miles), and Shabani Railway Co. Ltd. (62¾ miles), are worked by Rhodesia Railways Limited. The disappearance of the Mashonaland Railway Company, as a constituent company of the administration, marks the end of an association of 40 years with the fortunes of the two Rhodesias. As a pioneer company it did splendid work in opening up the country. In the report for the financial year ended September 30, 1937, which we have recently received, Sir Henry Chapman mentions that this is the last which will appear over his name as General Manager. Records were established during the year under review in the gross and net operating revenues, in the operating ratio, and in the tonnage handled. For an additional expenditure of only £270,766 or 9·7 per cent. in comparison with the previous year, increased receipts of £1,280,251 or 28·8 per cent. were earned. In comparison with 1928-29, the previous best year in operating results, revenue for 1936-7 was greater by £543,519, expenditure was less by £299,264, and net operating revenue was greater by £842,783.

Export copper traffic in the year under review produced receipts of £1,083,156, an advance of £350,569 or 47·9 per cent. on those for 1935-36, and marked the first occasion when receipts from this source had exceeded £1,000,000. Asbestos and other minerals also gave record traffics, and the receipts of £214,918 from chrome ore were 56·2 per cent. over those of the previous year. Receipts from general goods traffic (£2,627,775) were greater by £499,605 or 23·5 per cent., a portion of which related to machinery and stores required by mining companies in Northern Rhodesia. Coaching traffic earnings were greater by £44,054 or 11·9 per cent. Revenue from first and second class passengers improved by 10·5 per cent. and 11·6 per cent. respectively, partly on account of the Empire Exhibition at Johannesburg. The accompanying table compares some railway operating figures:—

	1936-37	1935-36
Passengers	845,555	734,234
Total tonnage	3,150,862	2,458,544
Operating ratio, per cent.	53·23	62·46
Train-miles	6,734,808	5,220,085
	£	£
Passenger receipts	401,114	357,060
Goods and mineral receipts (excluding departmental)	4,942,031	3,744,242
Gross earnings	5,730,677	4,450,426
Gross operating expenses	3,050,453	2,779,687
Net earnings	2,680,224	1,670,739

The net increase of £270,766 in operating expenditure was largely occasioned by additional traffic. Expenditure on permanent way and works was greater by £44,185 or 11·2 per cent., and the increase was practically accounted for by the cost of rail anchors, stone ballast, the replacement of curve-worn rails on the Beira—Umtali and Umtali—Salisbury sections, and by additional alterations given to bridges. Locomotive running cost £110,288, or 21·7 per cent., more, with an increase of 28·2 per cent. in engine mileage. Consequent upon an increase of 29 per cent. in train mileage, traffic running expenses were greater by 11·5 per cent. Good progress was achieved in the renewal of track with 80-lb. rails. The first year's programme, comprising 160¼ miles between Salisbury and Hunter's Road, was completed on July 8, 1937. On the 132½ miles of the Hunter's Road—Bulawayo section, relaying has been completed for 42 miles. The motor gang system of track maintenance was introduced on the Luanshya branch in August, 1937.

* * * *

A.T.C. on the L.M.S.R. and L.N.E.R.

IT has been known for some time that the L.M.S.R. was experimenting on its London-Shoeburyness line with an inductive system of A.T.C., and, as we announced last week, the L.N.E.R. has now decided to install it on the Edinburgh—Glasgow main line. Trials with such a form of apparatus were recommended by the Automatic Train Control Committee of 1929, and we believe that the action taken by the L.M.S.R. is in some measure attributable to that. The Southern Railway, referred to in the report as willing to undertake such trials, did so with Strowger-Hudd apparatus (see THE RAILWAY GAZETTE, October 2, 1931, p. 432) on its western main line near Byfleet. We are now able to reproduce on page 295 a description of the apparatus as installed on the L.M.S.R. and of the type to be adopted by the L.N.E.R. for its experimental section in Scotland. As with the G.W.R. system of A.T.C. (described in our issue of December 31, 1937, and June 10 this year), the equipment is at present applied to distant signals only and includes a brake application if the warning sounded on approaching an adverse signal is not acknowledged by the driver. The audible indication is given by a horn, whether the signal is "off" or "on," but in the former case a short blast only is heard. The principal difference between the two systems is that the L.M.S.R. apparatus, which is on the Hudd system, acts entirely by induction between permanent and electro-magnets on the track and a magnetic field receiver on the train, without any contact, so that weather conditions, such as snow and ice, can have no effect on its functioning, and no precautions in that respect are necessary. There are also no mechanical considerations, dependent on speed and other factors, to be taken into account. The operation has proved perfectly reliable at the highest speeds. Inductive A.T.C. apparatus has, of course, found considerable application on the Continent in recent years, especially on the German State and Swiss Federal Railways, as described in our issues for February 16, and September 7, 1934, and May 1, 1936, but generally with a source of electric energy on the train and electro-magnets on the track without power supply there. The apparatus in use on the Italian State Railways, however, comprises permanent and electro-magnets on the track, with local source of power, the train equipment being operated exclusively by compressed air.

It is interesting to record that the use of permanent and electro-magnets to actuate cab signals and train control devices was one of the earliest ideas to meet with any extended practical trial. One of the ablest inventors in this field, W. S. Boult, designed a very complete cab signal system on this basis, which was tried up to speeds of 70 m.p.h. on the Great Northern Railway. Speaking in a discussion at the Institution of Civil Engineers in December, 1900, he said he was "struck with the tacit assumption that the ideas of sixty years ago as to the best means of signalling to the driver were still the best conceivable. The time had come when it was really incumbent upon railway engineers to consider whether some better plan could not be found than three imperfect

systems." These were, he went on to say, the semaphore by day, lamps behind spectacles at night and, in foggy weather, when both were useless, "a sort of Egyptian arrangement"! (We think he must have meant to say "Egyptian Hall!") He proceeded to advocate a pure cab signal system, so that "it would be impossible for a driver to run past a signal without noticing it," and he advocated an audible indication which would "call the attention of the fireman even if the driver had temporarily lost his wits." Proceeding to demonstrate his apparatus he showed how permanent magnets on the line could act on armatures on the locomotive and that electro-magnets could restore them to their original positions and produce quite a number of indications, very well thought out. He was looking forward to the abolition of the ordinary signals, an event which has actually come about on certain sections in the U.S.A., though on the Pennsylvania, where cab signalling (described in THE RAILWAY GAZETTE of March 22, 1935, pages 541 and 552) has replaced A.T.C., the lineside signals are retained.

A later device on similar general lines was the warning cab signal of Stahmer, tried on the Prussian State Railway between Münster and Osnabrück. At about 200 m. (219 yd.) in rear of the distant signal a powerful permanent magnet was placed, suspended over the track on a bracket post; a collector element on the locomotive cab received the field emitted and concentrated it round a moving coil armature fed from a battery, causing it to rotate and operate visual and audible signals. It acted purely as an approach location warning, which had to be acknowledged by the driver. The construction of permanent magnets was not what it is now, however, and we think this had something at least to do with the failure to make progress with devices of this type in those early years. Boult's apparatus, too, was said to be costly.

There are several very interesting features in the design of the present L.M.S.R. system, such as the method of suspending the receiver from the locomotive, the positive action imparted to the valves, so that nothing depends on spring power, and the robust construction of all the parts. An important item is the so-called timing reservoir, to control the action of the main control valve in accordance with the length of the train, so that approximately the same braking effect is produced at all times, violent action on engines and short trains, where train pipe volume is small, being avoided. Another interesting device is the cancelling plunger used by the driver to reset the armature of the impulse receiver to normal after the warning effect is given at an adverse signal. An electro-magnet pulls the armature back but no special source of electricity is carried on the engine. Pressing the plunger induces a momentary current in the circuit by magneto action, which makes it impossible to produce a wrong effect by maintaining it pushed in. This is a device which appears to us susceptible of use in other directions on the railway. The electric portion of the equipment has thus been reduced to the minimum, the principal and most important functions being performed by vacuum effect, ensuring forced operation at all times.

The apparatus has, of course, been designed primarily for use with the ordinary two-position semaphore signalling system in service on an overwhelming proportion of the main line mileage of the railway, but consideration has, we understand, been given to adapting it to the modified conditions arising where multiple-aspect signals are used. In view of the important recommendations on A.T.C. in Colonel Mount's report on the Castlecary accident, dealt with in our issue for June 24 last, the work done by the L.M.S.R. in developing its inductive equipment is of more than ordinary interest at the present time, and credit is due to the company for undertaking the prolonged and expensive preliminary experiments and to its technical staff for their painstaking investigations into A.T.C. working.

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Signalmen's Wages

LAST week we published on page 259 Decision No. 4 of the Railway Staff National Tribunal upon the claims relating to signalling grades. The modifications of the 1922 National Agreement sought by the companies were comparatively minor, and so the claims of the National Union of Railwaymen occupied the main attention of the tribunal, which sat in public under the chairmanship of Sir Arthur Salter for four days and visited a number of signal boxes in order to become acquainted with the technical aspects of the issues upon which it was asked to adjudicate. With commendable promptitude its decision was issued, and the document—one of 36 pages—indicates that the claims, although complex, were carefully investigated. Stated briefly, the tribunal decided against the union's sweeping claims, which included pay increases all round and involved an additional annual cost of about a million pounds. Yet, as the tribunal pointed out, even this high figure does not allow for any further cost which might result from repercussions upon the pay and conditions of other grades than signalmen. The tribunal says it is obvious that "any general increase of the kind proposed would have a serious effect upon the general finances of the railway companies" and it has had therefore to limit its activities on this occasion to the consideration of "comparatively minor adjustments" which experience of the National Agreement and changes in methods, instruments and organisation of the signalling service—with consequent changes in the strain and responsibility falling upon certain signalmen—have shown to be desirable and justified.

The principal changes since 1922 are summarised in Part I of the document, and the tribunal finds that many new technical instruments have been introduced partly in order to increase safety and partly in order to reduce the amount of human work required for a given signalling service. A considerable capital expenditure has been involved, and absorbs a large portion of the amount represented by the wages of 4,407 signalmen, which is the number by which the signalling personnel has been reduced since 1922. The tribunal takes pains to emphasise that the economies effected by the companies were a substantial factor in the general financial position of the railways, which alone made possible the restoration of the standard rates of wages, and overtime, night duty, and Sunday duty rates awarded by the tribunal in 1936 and 1937, from which signalmen benefited in common with other grades. Here the tribunal bluntly observes that "it is impossible to regard the economies effected in a particular grade as specially earmarked for benefits to that grade as distinct from others." Moreover, the tribunal is satisfied that "the prospects of signalmen as a grade and their average remuneration have been improving." In the course of the presentation of the union's case, it was argued that the duties of signalmen, relief signalmen, and traffic regulators are becoming more responsible and exacting and that the physical and mental strain on the men concerned is increasing. The tribunal, however, has come to the conclusion that, on the average, the work or strain in a given class is not greater than when the present marks system was adopted in 1922, but it considers that there are some cases in the busiest boxes in which special work and responsibility are inadequately compensated. The union's claim for a six-hour working day for men in busy boxes fails, but the tribunal decides that an increase of half-a-crown a week should be granted

where the average number of marks is over 500 but under 700, with a further half-a-crown where the latter number is exceeded.

Another union claim which fails is that the differentials in wages provided in the National Agreement for boxes which do not normally control passenger trains should be abolished, but the tribunal agrees with the submission of the union that permanent-way motor trollies should be treated in all respects as trains. The use of these trollies is a new development since 1922, but there are only 611 of these vehicles on the four railway systems, and the cases in which a difference of working in respect of the operations in connection with the trollies would affect the classification of a box must be very rare. The proposals of the companies as to the marking to be adopted on sections of line where automatic or semi-automatic systems of signalling are operated are given a blessing by the tribunal, but actually affect only 199 out of a total of 8,859 boxes in which signalmen are employed. To sum up, it was never confidently expected that the full claims of the union could succeed, but, as the tribunal rightly remarks, it was only natural that after a lapse of sixteen years the system of marking should be re-examined in the light of experience and of new developments. The present finding is, of course, subject to acceptance by the N.U.R. and by the companies.

LETTERS TO THE EDITOR

(The Editor is not responsible for the opinions of correspondents)

The Flying Scotsman of 1888

London & North Eastern Railway,
King's Cross Station, August 4

TO THE EDITOR OF THE RAILWAY GAZETTE

SIR,—I have great pleasure in giving you preliminary advice that it has been decided to run a public half-day excursion by the "period" Flying Scotsman train, hauled by Stirling locomotive No. 1 on Wednesday, August 24, between King's Cross and Cambridge. The standard half-day excursion fare of 4s. 3d. will be charged irrespective of class, and the times provisionally arranged are as follow:

King's Cross	dep.	11.4 a.m.
Cambridge	arr.	12.46 p.m.
Cambridge	dep.	6.35 p.m.
King's Cross	arr.	8.14 p.m.

The old train and locomotive are to be put on public exhibition at Alexandra Palace station on Wednesday and Thursday, September 14 and 15, and it is hoped that the public excursion and exhibition may be made as widely known as possible.

It may also interest you to know that a guaranteed excursion by the old train has also been arranged for the benefit of the members of a railway society on Sunday, September 11, between London and Peterborough.

Yours faithfully,

E. G. MARSDEN,
Information Agent.

The Flying Scotsman

London, August 1

TO THE EDITOR OF THE RAILWAY GAZETTE

SIR,—Those who make a study of the performance of locomotives cannot fail to have been struck with the very considerable increases of weight which the various additions to the amenities of the Flying Scotsman have made to the weight of that train. This leads to some speculation as to how the locomotives will succeed in handling it to time when next October sees a return to normal winter working, with all the stops reinstated, and a load which hitherto has rarely been less than fourteen coaches and frequently, especially in the up direction (which in any event is the harder of the two, because of the additional stop at Darlington), mounts to fifteen vehicles. Now that an entire coach is taken up with the buffet and ladies' retiring room, it may well be that instead of 14 and 15 coaches, 15 and 16 coaches will be needed to provide the same accommodation. This, with the new stock, will mean a total tare of at least 535 or nearly 570 tons for 15 or 16 coaches respectively, and a gross load, with passengers and luggage, of anything from 560 to 600 tons behind the tender daily. With through locomotive workings over the 268¼ miles between King's Cross and Newcastle, this will prove a very heavy tax in winter weather on the capacity even of the "A4" Pacifics, especially south of York, where the timings are considerably faster than over the remainder of the journey.

This prompts the suggestion, however, that the problem of haulage would be considerably simplified if the timings of these and other East Coast trains (the streamliners included) were adjusted to demand equal speed over equal gradients. For example, that useful handbook *The Railway Magazine Gradients of the British Main Line Railways* shows the general run of the gradients from Grantham to York to be almost identical with that from Berwick to Newcastle; both runs have a falling start, one from Grantham to Newark and the other from Berwick to Beal; both have a moderate service slack about 33 miles out (Retford and Alnmouth); both have then a modest summit to surmount (Markham and Little Mill); and both have a severe service slack (Selby and Morpeth) before the end of the run. The inclination of the gradients and the severity of the slacks are in both cases very similar. Yet the schedule from Grantham to York demands an average speed of 59·8 m.p.h., while from Berwick to Newcastle nothing more than 53·5 m.p.h. is asked. Again, by reference to the tables of working times now shown in the interesting literature supplied by the L.N.E.R. to travellers, it is seen that over the section from Darlington to York—practically dead straight and almost all slightly downhill and in favour of the engine—the Flying Scotsman is allowed 45 min. for 44·1 miles—58·8 m.p.h.—and over the 27½ miles, all downhill, from Eryholme to Alne is booked at 63·5 m.p.h., whereas on the 60 m.p.h. schedule of the same train over the heavily-graded stretch from Grantham to King's Cross (105½ miles in 105½ min.) one of the timings, from Huntingdon to Hitchin, 27 miles, and concluding with the long 1 in 200 ascent to Hitchin, is scheduled at 67·5 m.p.h. Such examples could be multiplied.

A comparison of pre-war with present winter timings strongly reinforces the argument. The reductions in running times that have been effected since 1914 are 10 min. from King's Cross to Grantham, 17 min. thence to York, 9 min. on to Newcastle, only 2 min. from Newcastle to Berwick, and 5 min. from Berwick to Edinburgh. Coming up, the cuts have been 6 min. from Edinburgh to Berwick, 3 min. thence to Newcastle, nothing at all from Newcastle to Darlington (where the Flying Scotsman frequently arrives several minutes before time), 3 min. from Darlington to York, 12½ min. from York to Grantham, and no less than 17½ min. from Grantham to King's Cross. Either the pre-war timings of these and other East Coast trains must have been unduly severe on the North Eastern and the North British Railways, or, as seems more likely from a comparison of speeds with profiles, the Southern Area of the L.N.E.R. is now bearing the harder share of the speed burden. In the interests of future punctuality it is desirable that the distribution of time over the run between King's Cross and Edinburgh should be adjusted to an equal demand throughout, in which event it should be possible to keep time without serious difficulty; otherwise it seems fairly certain either that additional trains or additional locomotive power will be needed.

Yours faithfully,

VERITAS

PUBLICATIONS RECEIVED

A Modern Spanish-English and English-Spanish Technical and Engineering Dictionary. By R. L. Guinle. London: Geo. Routledge & Sons Limited. 68-74, Carter Lane, E.C. 9½ in. × 6¼ in. × 1 in. 311 pp. Price 15s. 0d. net.—The value of a really good technical dictionary is well known to many who, whatever the degree of knowledge they have of other languages, often find difficulties in dealing with special subjects. Spanish is a very important language in the industrial and commercial worlds and an up-to-date dictionary of the class under notice is most valuable. So much development has taken place in the technical field of late that the older works now inevitably leave much to be desired. The present work, which is well printed, includes a wide range of terms on a great variety of subjects, and we have tested its value by looking for many specialised expressions we required to understand. We found them all, and think the volume should meet a decided want in this important division of technical literature. Its size precludes its covering quite so many details as some other types of dictionary have essayed to do, but its price is a most reasonable one and very full value given for it.

Survey of Industries. City of Hull Development Committee, Guildhall, Hull. 9¾ in. × 6 in. 54 pp. Price 2s. 6d.—This is a new and revised edition of the "Survey of Industries" compiled by Mr. Arnold R. Tankard, City Analyst, in conjunction with the Hull University College. The survey was first published in 1936, to place on record the results of the investigations made on behalf of the Development Committee as to the industries for which Hull is suitable. It consists of a general index to a very extensive list of raw materials and products, with a catalogue of the more important imports into Hull and the manufactured products related to those imports. Charts are also given showing diagrammatically the products of distillation of wood and coal tar. The survey itself contains summarised technical descriptions of imported products used in the principal industries, and some of these brief descriptions are extraordinarily interesting, illustrated as they are by tabulated explanations of the different uses to which the products may be applied. The chart, for example, showing the principal derivatives of the distillation of coal tar, is a very clear demonstration of the extent to which modern science has applied this substance. A clear description is also given of acetylene, which, apart from its well-known uses as a gas, is the basis of synthetic rubber and other important new substances. With acetic acid and alcohol it plays a part in the manufacture of synthetic fibres such as artificial silk, while acetone is used for making the explosive cordite. Calcium carbide for the production of this all-important acetylene is imported at present from the Scandinavian countries. Acetylene is referred to here as being one of the products most frequently used in railway work, either in its original form or as a component, but the survey abounds in detailed descriptions of derivatives, such as cellulose products, synthetic resins, adhesives, &c., as well as silicon and other silica compounds, imported into Hull or manufactured in the district. Acknowledgment is made of the information given to the Development Committee in 1930 by Mr. E. V. Taylor, District Goods Manager of the London & North Eastern Railway at Hull.

Motorcars *via* Dover-Ostend.—Among a selection of attractive travel literature received from the Belgian Railways & Marine, 99, Regent Street, London, W.1, is a brochure on the arrangements and cheap rates for the conveyance of motorcars by special ferry or ordinary passenger steamer *via* Dover-Ostend. Vehicles are conveyed at rates for the single journey, ranging from £1 15s. to £4 12s. by the motorcar ferry *London-Istanbul*, or from £1 18s. 6d. to £5 1s. by the passenger steamers, the charge varying according to wheelbase. Lower rates are in operation for tricars and motorcycles. A passenger accompanying a car on the night (Ostend-Dover) sailing of the ferry is entitled to a free ticket for the crossing.

Lichttagessignale ; Die Entwicklung der Lichttagessignale seit dem Jahre 1928 : Die Entwicklung der Lichttagessignal-Schaltungen (Day Colour-Light Signals ; their Development since 1928 and the Evolution of the Control Circuits). By Dr. W. Schmitz. Berlin-Zehlendorf : Verlag Dr. A. Telzlaff, Publication No. 298 of the Vereinigte Eisenbahn-Signalwerke, Berlin-Siemensstadt. 8¼ in. × 11¾ in. 14 pp. 24 figures. Reprinted from *Zeitschrift für das gesamte Eisenbahn-Sicherungs- und Fernmeldewesen*, No. 14, 1937, and No. 1, 1938.—Light signals for main-line service were in use in America and Great Britain before trials were made with them in Germany, where, however, they had been installed before the war by an English manufacturer on the tunnel sections of the Berlin Elevated and Underground Railway. When it was decided to make trials on main lines, what may be called American designs of lenses and other fittings were followed, but were not considered to give satisfactory results. German firms then developed their own designs, the optical portions of which differ considerably from those met with elsewhere, solid lenses being used. The method of signalling at junctions in Germany and the importance attached to stand-by indications and facilities to meet failure of lamps or power supply led to the development of some interesting circuit schemes. In the present work Dr. Schmitz, who has made several valuable contributions to the technical history of signalling, outlines the course of these changes and the reasons for them in his usual clear and concise manner. The booklet is excellently printed and should be in the hands of all who are interested in colour-light signal practice on the Continent.

The Freedom of the Streets. By Jack Common. London: Martin Secker & Warburg Limited, 22, Essex Street, Strand, W.C.2. 7½ in. × 5 in. × 1 in. 263 pp. Price 6s. net.—When the author is describing the lives and thoughts of those to whom the public street is playground, meeting-place, and even university, he presents a picture of value to the social student because it is undistorted by bitterness or a striving after the sordid. He knows the conditions too well and depicts them too objectively to be a successful propagandist for reform, for his working men and women are moderately content with their way of life, and suspicious of influences which try to persuade their children to turn away from manual labour as a means of livelihood in favour of the office desk or the shop counter. But the author is not satisfied that this should be so, being irked at the way society divides into watertight compartments of classes. This irritation, unfortunately, leads him away from his lively and entertaining descriptions to flounder about in a gibing commentary on contemporary life that is not illuminating unless the reader is thoroughly conversant with the meaning (if any, when strung together in Mr. Common's manner) of such terms as "petty bourgeois," "dialectic," "mass-upsurge," "social-fascist," and so on. He offers nothing in place of present social conditions except a flow of phrases. The less fortunate members of society would have to be very desperate indeed (far more desperate than they appear in Mr. Common's convincing descriptions) before throwing everything overboard in exchange for a new order which when asked for food and money would hand out dictionaries.

Ship Wiring Cables.—A catalogue from Callender's Cable & Construction Co. Ltd. illustrates railway-owned vessels in which the company's rubber-insulated cables are used. One of these is the diesel ship *Lymington*, of the Southern Railway, built this year for the Lymington-Isle of Wight service and the first vessel in British waters to be fitted with Voith-Schneider propellers. Like all other ships in the Southern Railway fleet, it is wired throughout with Callender cables. The catalogue also illustrates the L.M.S.R. ship *Slieve Bawn*, which, with her sister ships *Slieve Bearnagh* and *Slieve League* uses these cables for all electrical wiring. A feature of several types of Callender cables is a sheath of special compound which will absorb any vibration to which the cable is subjected.

XUM

THE SCRAP HEAP

"THE TRANS-IRANIAN RAILWAY IS NEARLY FINISHED"

Awake! for streamlined trains by day and night
Invade the plain where camels held the right:
And lo! the cloud of vapour in the sky
The Sultan's turret folds in banners white.

Dreaming how rails of steel had crossed the plain,
I heard a voice within the car exclaim,
"Awake, ye passengers, your tickets, please,
Before we end the journey of the train."

And as the flag waved he who stood before
The station cried "Hurr' up" and "Mind the door:
Ye know how little while we have to stay
And the departure hour is nearly o'er."

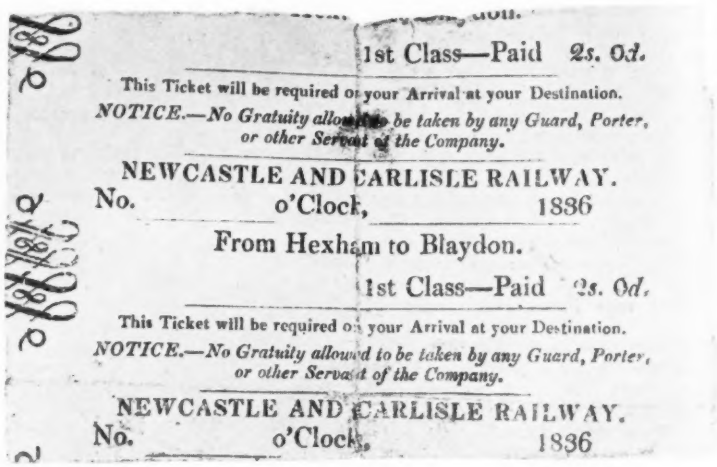
Here with a sandwich in the buffet car;
A timetable, a cocktail at the bar—
And other passengers to journey with,
And Persia's wilderness will not seem far.

The enterprise men set their hearts upon,
Accomplished now, and prospers, and anon
Like manna in the desert's dusty waste
May earn perhaps a dividend, p'haps none.

Ah, well! could railwaymen with Fate conspire
To grasp the motor traffic scheme entire,
Would they not shatter it to bits and then
Remould it to the shareholder's desire!

G.L.B.

We are indebted to Mr. G. F. Quartermain for lending us from his collection the interesting ticket reproduced. The original, which is printed on a light buff paper, is obviously part of a sheet (probably bound in book form), and intended to be detached by scissors in individual units. It will be noticed that this unused specimen includes portions of previous and subsequent tickets.


1st Class—Paid 2s. 0d.
This Ticket will be required on your Arrival at your Destination.
NOTICE.—No Gratuity allowed to be taken by any Guard, Porter, or other Servant of the Company.
NEWCASTLE AND CARLISLE RAILWAY.
No. o'Clock, 1836
From Hexham to Blaydon.
1st Class—Paid 2s. 0d.
This Ticket will be required on your Arrival at your Destination.
NOTICE.—No Gratuity allowed to be taken by any Guard, Porter, or other Servant of the Company.
NEWCASTLE AND CARLISLE RAILWAY.
No. o'Clock, 1836

A Newcastle & Carlisle Railway paper ticket of 1836

Field-Marshal Göring is reported by the *Evening Standard* to be a model railway enthusiast, owning an electrically-operated system controlled from a keyboard "as large as an organ's." Here he is accustomed to entertain visitors to Karinhalle, his hunting lodge near Berlin, winding up his display with a "set-piece" in which a model aeroplane zooms over the track and bombs a train passing over a bridge. The supposed nationality of the doomed train is said to be varied according to the prejudices of the playful field-marshal's visitors.

* * *

A GOOD WORD FOR THE CROSSING

A correspondent in *The Times* remarks that at week-ends and bank holidays it is only when motor traffic is held up at a railway level crossing that pedestrians can safely cross the road.

* * *

When the *Mercury*, upper component of the Short-Mayo composite aircraft, arrived in Montreal after her non-stop flight across the Atlantic from Foynes, she carried a letter of greeting from Sir John Reith, Chairman of Imperial Airways, to Mr. S. J. Hungerford, President of the Canadian National Railways and their associate, Trans-Canada Air Lines. Mr. Hungerford's reply to Sir John was carried back to Great Britain by the *Mercury* on her return from Montreal to Southampton.

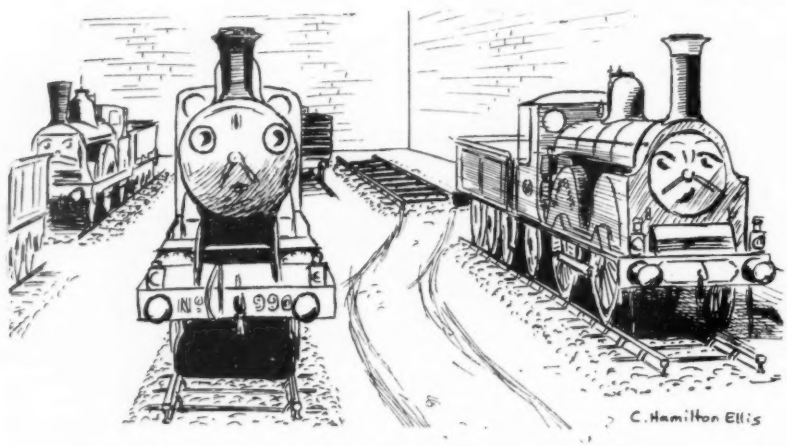
* * *

EUSTON GATES

On Friday (July 20, 1838) the large and elegant iron gates were affixed to the entrance of the London & Birmingham railway at Euston Square. Two extensive hotels are about to be erected on the large open space in front of the entrance.—*From "The Observer" of July* 24, 1938.

* * *

It is reported from Berlin that, at the German Rowing Championships, which are to be held on August 20 and 21 at Heilbronn, on the Neckar, a mobile grandstand similar to that which was used during the Olympic Games of 1936, will enable spectators to follow the races without leaving their seats. The stand will consist of a goods train of six flat trucks, upon each of which will be erected banks of seats capable of accommodating about 80 persons, so that the train will carry 500 spectators. This mobile grandstand will run on a line extending 540 yd. from the starting point.



Scandal at York Museum: G.N.R. No. 1 *goes on the razzle*

Gladstone: "Really, Oakley, as a Great Northern engine, you might have kept an eye on her!"

OVERSEAS RAILWAY AFFAIRS

(From our special correspondents)

WESTERN AUSTRALIA

Wheat Traffic

One of the principal items of traffic on the Western Australian Railways is wheat, and the finances of the Railway Department are largely influenced by the nature of the wheat harvest. The State's maximum wheat yield was in 1929-30 when over 53 million bushels were harvested, but with the low prices obtained during the following years the output declined to less than half this figure. The more favourable prices during the past two or three years have again given a stimulus to wheat growing, and the 1936-37 harvest was estimated to yield approximately 33 million bushels.

The task of transporting the wheat harvest to ports and mills falls on the railways, principally during the months December to May, and this has been the case during the past season, a total of 708,537 tons having been carried from the beginning of the season up to June 25, compared with 400,553 tons during the same period last year. At the same date there were still 107,000 tons of wheat at country sidings, and this carry-over will provide additional loading for trains during the normally slack period.

Bulk handling of wheat has been introduced during the past few years throughout the wheat-growing districts, and the adoption of this method as compared with the old bag method has resulted in the restriction of wheat traffic to highsided trucks, as against the use of practically every type of wagon for bagged wheat. So that full advantage may be taken of the capacity of wagons available, the sides of open trucks are raised by means of temporary canvas fittings, enabling grain to be loaded above the tops of the ordinary side walls of the trucks and the full carrying capacity of each vehicle to be used.

SOUTH AFRICA

Table Bay Reclamation Scheme

Details of the agreement between the City Council of Cape Town and the railway administration over the new foreshore have been announced. Briefly, the agreement lays down that the railway administration will pay the cost of the extension of the existing storm water drains, at an estimated cost of £200,000. The City Council will be responsible for the cost of providing secondary drainage and roadways in the new reclaimed area. The cost of this work is estimated at £750,000. The council will further pay the railway administration £250,000 as soon as the layout is available for the sale of building lots for development purposes. The cost of any bridges or subways made necessary by the reclamation scheme will be borne jointly by the railway and the City Council in the ratio of 60 to 40. The council will pay for any land required for civic purposes provided the cost is reasonable.

Cape Eastern Main Line Improvements

The first big practical move in the £1,000,000 scheme for the improvement of the Cape Eastern main line is now being undertaken by the establishment at Dohne and Toise River of a model village which will house the white labour force that will for the next few years be engaged in the work of reconstructing the line from East London to the north. The transfer involves taking down complete houses, halls, churches, and schools in Natal and their re-erection at Dohne and Toise River, to house about 1,000 people. The reconstruction of the railway line, which involves the elimination of sharp curves, the reduction of steep gradients, and the construction of tunnels, will be in full swing before the end of the year. Eight new tunnels will be cut. The new line will make possible a faster service to the Rand, and the Border will therefore share to a greater extent in the expanding trade of the country.

RHODESIA

New Station at Umtali

Occupation has recently been taken of the new station building at Umtali, a town on the eastern border of Southern Rhodesia, 204 miles from the port of Beira. The new building is an attractive structure of red brick with a tiled roof, surmounted by a clock tower; all doors and windows are painted green. The centre portion is double-storeyed and the offices upstairs accommodate the District Engineer and his staff, while the ground floor provides the usual station, parcels and telegraph offices, waiting rooms and a central booking and luggage hall. Apart from the main building, a combined customs and immigration office block is being provided at the eastern end of the platform, where the necessary examination may be conducted of passengers entering Rhodesia from Portuguese East Africa. Concurrently with the provision of the new building, opportunity has been taken to improve the road access to the station and provide more parking space, and the platform will be covered with umbrella roofing. The new facilities are a great improvement on the old station and will be appreciated by passengers using them, including the numbers of tourists proceeding to the Vumba, Melsetter, and Inyanga mountain districts within easy reach of Umtali. In the illustration of the new building on page 304 may be seen a portion of the old wood and iron station in the background.

Continued Improved Earnings

The financial results for the six months ended March 31, 1938, compared with the same period for the previous year, show a continued improvement in the earnings of the Rhodesia Railways, as the following table indicates :—

	Six months ended March 31		Increase
	1938	1937	
	£	£	£
Total earnings...	3,097,006	2,586,548	510,458
Gross operating expenditure ...	1,643,304	1,451,337	191,967
Net operating revenue ...	1,453,702	1,135,211	318,491

During March, 1938, however, there was a slight decrease in revenue compared with 1937, due principally to a falling off in mineral traffic, particularly copper and chrome ore for export. During the period April-September, 1937, record tonnages were dealt with, and the second half of 1938 may not compare quite so favourably as the first part of the current financial year, particularly as expenses will be higher due to the recent increase in rates of pay.

FRANCE

Reduction of Passenger Tax

In connection with the estimated operating deficit of fr. 3,000 million this year the National Railways Company (S.N.C.F.) applied for permission to raise its fares by a further 20 per cent. In order to obviate the decline in traffic, which would follow higher fares, M. Frossard, Minister of Public Works, proposed to aid the company by other measures. With the assent of the Minister of Finance the tax on passenger tickets has now been reduced from 12 to 2 per cent. This measure came into force on August 1. The S.N.C.F. will benefit by the reduction of the tax to the amount of fr. 400 million a year, and passenger fares will remain unchanged.

The S.N.C.F. has also been authorised to effect certain other economies. One of these affects the number of railwaymen employed. For a number of years, men who retire on pensions will not be replaced. The rail and road co-ordination plan, which involves the abandonment of certain lines and closing of stations, will facilitate this step. The number of vacancies not to be refilled is about 15,000 a year.

Railway Workers' Convention

The S.N.C.F. and the National Federation of French Railway Workers have just concluded the drafting of a collective convention after negotiations lasting nearly two years under the direction of M. Frossard, Minister of Public Works, and M. René Claudon, Director General of Railways and Transport. This convention governs

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500,000 workers. A *communiqué* issued by the Minister of Public Works explains that the delay of eleven months in drafting the convention after the formation of the National Railways Company was due to the complicated details and technical difficulties. It adds that the convention incorporates a definite solution of the thorny question of the railway workers who were dismissed after the general strike of 1920. This question has been a constant source of complications between the railways and their workers. The convention also comprises some modification of the 40-hr. week.

Nationalisation in Morocco

A commission has been appointed in French Morocco to report upon the question of the nationalisation of the railways and other means of transport.

Railcar for Compiegne Museum

The first Micheline built for the French railways has been placed on view in the museum of old vehicles at Compiegne.

Shunting Accident Stops Traffic

A shunting accident at Choisy-le-Roi, a suburban station about nine miles from Paris, in the early hours of July 29, brought traffic to a standstill on the electrified lines to and from Austerlitz and Orsay, the Paris termini of the former Paris—Orleans system. While being shunted, some wagons collided with such force that one was derailed and thrown across the up and down tracks of the main lines. The wagon also struck a standard supporting the electric power wires; the standard collapsed and the power supply was interrupted for several hours, stopping all the main-line traffic. Suburban traffic is heavy at Choisy-le-Roi, and, as train services were impossible, S.T.C.R.P. (Paris District Transport Company) buses were called upon to deal with the early morning rush. All main-line expresses and trains from the outer suburbs were diverted at Juvisy (15 miles from Paris) and steam hauled into the Gare de Lyons, the terminus of the former P.L.M., trains arriving from one to two hours late. Traffic became normal again in the afternoon.

NORTHERN IRELAND

M'Lintock Transport Committee

The M'Lintock Committee, appointed by the Government of Northern Ireland to inquire into the financial and technical aspects of the Northern Ireland Transport Act, met recently at the Ministry of Commerce, Belfast. The members of the committee are:—

Sir William M'Lintock, Chairman, Senior Partner in the firm of Thomson, M'Lintock & Co. London and Glasgow; Sir Herbert Walker, former General Manager of the Southern Railway; and Mr. J. S. Nicholl, Managing Director of Macnamara & Co. Ltd., general haulage contractors, London.

The proceedings were held in private, but it is believed that the Northern Ireland Road Transport Board's side of the case was heard, that for the railways having been taken in London. In addition to making acquaintance with the internal administration of the board and with conditions in rural areas, necessitating a journey or two from the city, the committee met representatives of canal and other interests during its brief stay in Northern Ireland. Its report will be placed in the hands of the Northern Ireland Government in the course of a few weeks.

BRAZIL

Railway Expansion and British Exports

A feature of the Brazilian import market at the present time is the heavy demand for railway material and rolling stock. With an area and a population about equal to those of all other South American republics combined, Brazil can no longer disregard the importance of its transport problem, which has become specially acute due to (*a*) the long-deferment of replacing obsolete material; (*b*) the greater demand made on its deficient rail transport by the movement of heavier agricultural crops; and (*c*) the increased population of the two chief cities, Rio de Janeiro and São Paulo, necessitating the provision of more adequate suburban transport facilities.

At the end of 1936 there were 33,511 route km. of railway in operation, and extensions comprising a further 828 km. were in hand. The first part of the electrification of the suburban section of the Central Railway (described in the *Electric Railway Traction Supplement* to THE RAILWAY GAZETTE of March 4 last) provided scope for British engineering, but it is regrettable that the execution of the second part of the scheme is at a standstill.

In the meantime, no great interest seems to be displayed by Great Britain in regard to other requirements, and British industry would do well to examine more closely the potentiality of Brazil. For instance, in view of the heavy world demand for manganese, it should be noted that Brazil has almost inexhaustible supplies of this mineral, but little progress has been made in placing this ore at the ports for export, and, seeing that economical export depends mainly on adequate transport facilities, there would seem to be scope for the negotiation for the supply of much railway equipment. Admittedly, this presents certain difficulties, but they appear slight in relation to the advantages that might accrue from an exchange of manufactured articles urgently required by Brazil on the one hand, and raw materials so necessary to British interests on the other. Brazilians are naturally turning to countries offering the easiest terms of payment, and the recent purchase from Italy of two Fiat railcars by the Central Railway, as also an order for 24 steel passenger coaches and 500 steel wagons placed with Germany by the Sorocabana Railway, and 11 Mountain type locomotives and 400 wagons by the Viação Ferrea do Rio Grande do Sul, are significant of the facilities offered by these countries. In addition, the firm of A. Thum has just delivered 200 steel 50-ton wagons and five Texas and five Santa Fé type locomotives to the Central Railway for the transport of manganese.

Till recently Great Britain was Brazil's principal coal supplier, but last year German exporters obtained much larger orders, valued at £1,348,000 compared with Great Britain's £928,000 and the U.S.A.'s £211,000. In addition the Minister of Transport has just requested a supplementary credit of 40,000 contos for the purchase of another 250,000 tons. It will be interesting to see where the order for this is placed.

Demand for Railway Equipment

Latest developments likely to increase the demand for railway equipment are: (*a*) the treaty signed between Brazil and Bolivia entailing the construction of a railway between Brazilian territory and Bolivia, referred to in THE RAILWAY GAZETTE of March 11 and 27; (*b*) the approaching completion of a line from São Paulo to the port of São Sebastião; and (*c*) the construction of a line from the manganese fields of Minas Geraes to the coast, all of which are apart from the 828 km. of extensions in hand and already mentioned. A company has been formed in Rio de Janeiro with the object of exploiting the Bennie Railplane system of transport in and about the city.

Substantial increases were noted in the value of imports of railway material into Brazil last year, a comparison of some articles being as follows:—

Imports	1936 £ Sterling	1937 £ Sterling
Coal...	...1,722,000	2,588,000
Rails and fittings ...	... 612,000	1,007,000
Carriages and wagons	... 340,000	676,000
Workshop equipment	... 240,000	339,000
Locomotives ...	... 285,000	320,000
Axles, wheels, &c....	... 212,000	247,000
Boilers for steam engines...	90,000	108,000

As in the case of coal, Great Britain lost ground to other countries, Belgian exporters making progress in the export of certain articles, particularly rails and fishplates, as the following comparison shows:—

	Rails and accessories 1936 £ Sterling	1937 £ Sterling
Belgium	56,000	322,000
U.S.A.	92,000	256,000
Germany	307,000	176,000
Poland	12,000	147,000
Japan	2,000	53,000
Great Britain	85,000	35,000

In regard to locomotives, however, total imports were divided as follow: Great Britain £176,000 against £27,000 in 1936; Belgium £75,000 against nil; Germany £36,000 against £245,000. Belgium was the chief supplier of coaching stock last year with £407,000, Great Britain second with £263,000, and Germany third with £23,000.

BRITISH RAILWAY STATISTICS

"The Railway Gazette" monthly table for April, 1938, as compared with April, 1937, compiled from the Ministry of Transport Statement No. 221

Description	Great Britain*	G.W.R.	L.N.E.R.	L.M.S.R.	S.R.
PASSENGER TRAIN TRAFFIC—					
Number of pass. journeys (ex. season ticket holders)	104,294,320	7,361,451	14,560,323	24,647,411	18,599,224
Increase (+) or decrease (−)	+ 711,162	+ 435,730	+ 219,718	+ 903,300	+ 684,348
Passenger receipts (excluding season ticket holders)	£4,849,173	£650,514	£981,095	£1,561,763	£1,054,705
Increase (+) or decrease (−)	+ £1,089,331	+ £183,131	+ £233,145	+ £414,628	+ £234,606
Season ticket receipts	£857,430	£49,860	£148,512	£217,057	£298,210
Increase (+) or decrease (−)	− £40,623	− £9,444	− £5,229	− £8,885	− £1,716
Parcels and misc. traffic receipts (excluding parcels post)	£1,074,239	£198,645	£326,608	£409,766	£119,991
Increase (+) or decrease (−)	− £36,621	− £3,239	− £10,700	− £14,089	− £6,143
FREIGHT TRAIN TRAFFIC—					
Freight traffic (tons) (excluding free-hauled)	20,883,813	5,123,225	9,374,751	9,712,138	1,144,786
Increase (+) or decrease (−)	− 2,137,440	− 214,488	− 948,854	− 1,196,372	− 152,729
Net ton-miles (excluding free-hauled)	1,208,249,230	226,724,233	408,947,972	490,758,113	50,410,503
Increase (+) or decrease (−)	−132,923,093	− 22,316,405	− 41,359,960	− 59,796,648	− 4,386,787
Average length of haul (miles) (excluding free-hauled)	57·86	44·25	43·62	50·53	44·03
Increase (+) or decrease (−)	− 0·40	− 2·41	—	+ 0·06	+ 1·80
Freight traffic receipts	£6,922,159	£1,200,000	£2,290,433	£2,854,000	£361,899
Increase (+) or decrease (−)	− £367,570	− £40,700	− £113,567	− £185,000	− £15,766
Receipts per ton-mile	1·375d.	1·27d.	1·34d.	1·40d.	1·72d.
Increase (+) or decrease (−)	+ 0·071d.	+ 0·07d.	+ 0·06d.	+ 0·07d.	+ 0·07d.
Freight train-loads: Average train-load (tons)	125·28	130·09	129·24	123·64	103·99
Increase (+) or decrease (−)	− 10·14	− 12·15	− 10·90	− 9·14	− 7·83
Net ton-miles—					
Per train engine-hour	975·70	1,032·61	1,026·58	938·50	793·81
Increase (+) or decrease (−)	− 9·33	− 29·56	− 18·13	+ 11·54	− 55·35
Per shunting-hour	876·79	791·82	967·97	911·01	576·97
Per total engine-hour	461·80	448·16	498·21	462·28	334·12
Net ton-miles per route-mile per working day	2,802	2,831	2,996	3,285	1,144
Increase (+) or decrease (−)	− 266	− 201	− 271	− 360	− 78
Wagon-miles. Total	347,930,546	65,209,375	122,136,648	143,669,433	16,591,715
Increase (+) or decrease (−)	− 24,263,550	− 2,230,281	− 7,667,035	− 13,187,160	− 851,163
Percentage of loaded to total	66·82	67·53	64·64	68·42	66·29
Wagons per train. Total	33·72	34·08	33·95	33·71	31·59
Increase (+) or decrease (−)	− 1·82	− 1·93	− 1·92	− 1·73	− 1·80
Loaded	22·53	23·01	21·95	23·06	20·94
Empty	11·19	11·07	12·00	10·65	10·65
Train-miles. Coaching—Per train-hour	15·22	14·20	14·42	14·40	17·96
Per engine-hour	12·24	11·29	11·10	11·08	15·26
Train miles. Freight—Per train-hour	9·21	9·68	9·36	8·93	9·28
Per engine-hour	3·69	3·46	3·91	3·73	3·17
Engine miles. Total	46,075,992	7,397,551	12,865,773	16,911,755	6,147,183
Increase (+) or decrease (−)	− 308,038	+ 61,081	− 53,096	− 420,241	+ 95,544
Mileage run by engines. Total train-miles—					
Coaching	23,063,665	3,105,038	5,335,522	7,382,549	4,623,326
Freight	10,316,481	1,913,166	3,597,481	4,261,637	525,142
Engine-hours in traffic. Total	4,895,348	855,766	1,476,895	1,893,314	487,680
Increase (+) or decrease (−)	− 171,349	− 8,201	− 41,813	− 116,943	− 4,092
Shunting miles per 100 train-miles—					
Coaching	7·28	7·02	6·71	7·72	7·62
Freight	70·90	81·95	65·49	66·46	93·23

***Passenger Traffic Statistics*: Number of journeys, receipts, and receipts per journey (excluding season ticket holders)—April, 1938**

Subject	Great Britain	G.W.R.	L.N.E.R.	L.M.S.R.	S.R.	Cheshire Lines	Liverpool Overhead	L.P.T.B.†	Mersey
Full fares—									
Pass. journeys	32,552,418	678,647	969,636	1,450,491	2,857,457	14,565	155,743	25,527,160	84,401
Gross receipts	£945,589	£86,139	£137,759	£139,519	£205,613	£2,682	£1,681	£355,213	£1,535
Receipts per pass.	6·97d.	30·46d.	34·10d.	23·08d.	17·27d.	44·19d.	2·59d.	3·34d.	4·36d.
Reduced fares—									
Excursion and week-end—									
Pass. journeys	42,408,365	4,517,684	9,328,632	15,266,415	9,377,074	441,357	97,340	1,626,620	680,460
Gross receipts	£3,046,290	£463,319	£686,004	£1,142,093	£636,908	£29,279	£1,090	£36,674	£11,336
Receipts per pass. journey	17·24d.	24·61d.	17·65d.	17·95d.	16·30d.	15·92d.	2·69d.	5·41d.	4·00d.
Workmen—									
Pass. journeys	25,069,260	1,628,223	3,328,619	6,653,730	5,439,018	245,602	217,100	6,491,114	241,022
Gross receipts	£376,485	£25,087	£56,359	£111,459	£91,737	£4,271	£1,884	£73,343	£2,135
Receipts per pass journey	3·60d.	3·70d.	4·06d.	4·02d.	4·05d.	4·17d.	2·08d.	2·71d.	2·13d.
Other—									
Pass. journeys	4,252,435	534,331	931,266	1,271,317	924,171	30,761	50,070	415,206	13,524
Gross receipts	£465,115	£72,631	£97,869	£161,270	£118,749	£3,550	£346	£3,933	£229
Receipts per pass. journey	26·25d.	32·62d.	25·22d.	30·44d.	30·84d.	27·70d.	1·66d.	2·27d.	4·06d.
Total—									
Pass. journeys	104,294,320	7,361,451	14,560,323	24,647,411	18,599,224	732,379	520,253	34,060,100	1,019,407
Gross receipts	£4,849,173	£650,514	£981,095	£1,561,763	£1,054,705	£39,853	£5,001	£469,163	£15,235
Receipts per pass.	11·16d.	21·21d.	16·17d.	15·21d.	13·61d.	13·06d.	2·31d.	3·31d.	3·59d.

* All standard gauge railways † Includes passengers originating on the railway undertakings, and on the Whitechapel and Bow Joint Railway

MODERN CAST IRON AND STEEL FOR RAILWAY USE

A review of the recent rapid progress made, with particular reference to the development of alloys

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THE rapid advance in the development of alloy steels exhibiting great technical advantages besides maximum strength and wearing resistance, has rendered possible the construction both of high-power and high-speed locomotives and of permanent way with the maximum stability and durability. The progress thus achieved during a comparatively short time was due not only to the purely metallurgical improvements of the steels and steel alloys, and to progressive working methods, but to the rapid advance made in methods of testing and studying materials in their raw and worked state, permitting the ratio of weight to power and of dead weight to useful weight to be continuously improved. The same applies to the development of the cast and wrought iron alloys used for the construction of railway plant and rolling stock.

Referring first to the various modern types of cast iron, it is generally admitted that the introduction of molybdenum and, for special purposes, of vanadium in cast iron alloys represents the most important advance effected in this respect during recent years. The favourable influence of molybdenum on cast iron is due to the uniform distribution of the carbides and of the graphite induced thereby, which is independent of the speed of cooling. This eliminates the excessive tensile and compression stresses caused by considerable differences of wall thicknesses in castings, frequently leading to cracks when the cast iron material contains no molybdenum. X-ray observations indicate that the structure of cast iron castings containing suitable percentages of molybdenum is free from the stresses otherwise present, while hardness tests show that the Brinell hardness of these castings is almost the same at all points irrespective of the wall thicknesses. It has been found in a large German locomotive works that a cast iron containing 3·15 per cent. of carbon, 1·83 per cent. of silicon, 0·53 per cent. of manganese, 0·64 per cent. of phosphorus, 0·11 per cent. of sulphur and only 0·70 per cent. of molybdenum, which was used for the manufacture of locomotive cylinders, exhibits a tensile strength 35 per cent. higher than similar material containing no molybdenum, while the bending strength increase of the molybdenum iron amounts to 19·7 per cent.*

Monel Cast Iron

Another modern cast iron of valuable technical properties is the so-called Monel cast iron, which contains small amounts of copper and nickel in a proportion copied from that of Monel metal (*i.e.*, 70 per cent. nickel and 30 per cent. copper). According to H. Buergel† it is possible with a Monel cast iron poured under a pressure of up to 7 atmospheres into chill moulds to manufacture camshafts for internal-combustion engines which exhibit a longer life under severe operating conditions than similar camshafts made of chromium-nickel steel. It is true that the opinions of experts regarding this type of cast iron are not uniform, but it is generally accepted that Monel cast iron can be used for parts not subjected to excessive stresses, such as camshafts. Cast iron containing about 1 per cent. of copper and 2 to 3 per cent. of nickel therefore forms a valuable material for numerous locomotive parts, as it can be heat-treated to a Brinell hardness of 300. Its technical properties can be still further improved by the addition of 0·15 per cent. of molybdenum and 0·10 per cent. of vanadium.

The quality of castings naturally is largely influenced by the mode of manufacture. Non-circular parts are frequently die cast under considerable pressure, while round or circular castings develop special properties by centrifugal casting. The centrifugal effect is obtained by rotating the moulds, although centrifugal castings can also be obtained in special machinery with stationary moulds.* Centrifugal casting is now carried out by nine different processes and is suited particularly to the manufacture of cylinders, pistons, and piston rings, as well as of non-ferrous axlebox brasses, especially bronze bearings. Apart from the increased density due to the centrifugal forces created, the latter also cause the removal of all specifically light impurities such as slag enclosures, gas bubbles, and so on. The castings therefore are free from blow holes and pores; they are homogeneous and dense, and are of uniform thickness and refined structure.

Cast steel, also, has been very much improved during the last few years. It has been possible, for instance, to increase corrosion resistance considerably by the addition of small percentages of copper, and of copper and silicon. A number of steel alloys exhibiting a particularly high degree of strength and wearing resistance at elevated temperatures, and therefore well suited for grate bars, fire doors, ash pans, and similar parts, have the following composition: 0·25 to 0·35 per cent. carbon, 1·8 to 2·2 per cent. nickel, 2·1 to 4·5 per cent. chromium, and 0·15 to 0·80 per cent. molybdenum.

Nichrotherm Alloys

These alloy steels include the Nichrotherm alloys (NCT) developed by Krupp. They are characterised by austenitic structures, fair working properties at normal and elevated temperatures, high strength at higher temperatures, and good electric welding properties. Attention is called to the fact that in welding these alloys the welded articles must be connected with the negative d.c. pole, while the special electrodes are connected with the positive pole; the arrangement is thus contrary to that used in welding ordinary mild steel material. The welding rods are generally of the same composition as the parts welded, the only difference being a slight concentration of alloying elements to compensate for oxidation losses. These heat-resisting alloys can also be used to advantage for parts subjected to considerable wear, such as combustion chamber inserts in diesel engines for mines and light railway locomotives, piston tops, exhaust valves, and so on.

Alloys of maximum resistance to elevated temperatures and mechanical wear contain 0·25 to 0·35 per cent. carbon, 2·0 to 2·7 per cent. nickel, 2·0 to 3·0 per cent. chromium, and 8 to 10 per cent. tungsten. The Krupp alloy V2AED possesses a minimum continuous strength of 31,000 lb. per sq. in. at 1,100° F., and of about 21,000 lb. per sq. in. at 1,300° F.

It is practically impossible to produce the highest

* S. B. Ritschie: "Molybdenum in High Special Steel," Army Ordnance, Vol. II, 1930. Also Gregg and Gillet: "Molybdenum Today and Tomorrow," "Metals and Alloys," 1932, p. 98. Also "Molybdän in Stahl und Eisen," publication of the Gesellschaft für Elektrometallurgie, Berlin, 1933

† "Deutsche Austauschwerkstoffe," publisher: Julius Springer, Berlin, 1937

* A. Väth: "Der Schleuderguss," VDI-Verlag, Berlin, 1934

grade steel alloys without certain percentages of vanadium.* The high degree of affinity of vanadium for oxygen makes this substance a desirable de-oxidising agent producing pure, heat resisting, easily rolled and wrought steels of fine structure. It improves the resistance to oscillation, the mechanical strength and the breaking strength of steel without reducing the ductility of the material. Vanadium steel is particularly suitable for heavy and complicated forgings with difficulty quenched in oil or water. It is also satisfactory for most locomotive forgings such as piston rods, coupling pins, and driving axles. Vanadium added in amounts of 0·1 to 0·4 per cent. to carbon steels forms the phase of vanadium carbide soluble in gamma-iron; it does not form double carbides with iron carbide, but remains the plain vanadium carbide V_4C_3 which is not influenced by the mutual interferences between iron and iron carbide. Vanadium carbide is not dissolved on exceeding the perlite point but only after the entire matrix has been completely transformed into gamma-iron, although even in that case, the solution takes place only gradually and with rising temperatures without ever reaching completion. Vanadium steels must therefore be chilled at a somewhat higher chilling temperature in order to attain maximum heat-treating values. The dissolved vanadium carbide precipitates only gradually during the subsequent annealing treatment, which introduces the added advantage that the breaking strength is not lowered like the tensile strength with rising annealing temperatures, but that it is still increased until the annealing temperatures reach about 1,100° F. The following table compares vanadium-free steel with a vanadium steel:—

	Carbon steel	Vanadium steel
Carbon content, per cent. ..	0·47	0·47
Manganese ,, ,, ..	0·62	0·84
Silicon ,, ,, ..	0·25	0·20
Phosphorus,, ,, ..	0·04	0·03
Sulphur ,, ,, ..	0·038	0·036
Vanadium ,, ,, ..	—	0·19
Yield point, lb per sq. in. ..	56,400	80,000
Tensile strength, ,, ..	97,400	111,000
Elongation (l = 5d) per cent.	25·0	23·5
Contraction, ,,	43·5	47·0

The above table shows that in spite of the strength increase caused by the higher manganese content of the vanadium steel, there is no corresponding reduction of the strength but an improvement of the yield point: tensile strength ratio, which amounts to 58 per cent. in the carbon steel and to 71 per cent. in the vanadium steel. Apart from its affinity for oxygen, vanadium also exhibits a considerable affinity for nitrogen, with which it tends to form vanadium nitride, and this facilitates the absorption of nitrogen in the nitride hardening processes developed and protected by the Krupp works.

Nitride Hardening Advantages

The most important advantage offered by this hardening process is the attainment of a very pronounced surface hardness unaccompanied by warping or distortion of the hardened parts. The hardened surface layers are inseparably connected with the softer and more ductile core of the hardened parts. A very efficient nitrogen carrier besides vanadium is aluminium. The nitride hardening process offers important technical and commercial advantages besides those above enumerated. Chief among these is the considerable improvement of the corrosion resistance of the steel hardened by nitriding, rendering this material particularly useful for the manufacture of bolts and nuts, stuffing box parts, joint pieces, and so on.

* "Vanadium im Baustahl," publication of the Vanadium Gesellschaft, Berlin, 1935

The considerable development of track materials achieved during recent years, necessitated by increases in the weight of rolling stock, the speed of trains, and frequency of service, was rendered possible in the first place by suitable modifications and improvements of the heat-treatment of ordinary rail steels, but also by the introduction of certain constituents calculated to induce the properties specially demanded by railway service. It was thus possible in Germany to increase the proportional limit (ratio of yield point to tensile strength) of a Thomas rail steel (containing 0·45 to 0·60 per cent. carbon, 0·10 to 0·30 per cent. silicon, 0·80 to 1·10 per cent. manganese and 0·23 to 0·28 per cent. vanadium) to 74 per cent.; while in the case of an open hearth steel containing 0·50 to 0·60 per cent. carbon, 0·30 to 0·60 per cent. silicon, 1·00 to 1·50 per cent. manganese, and 0·23 to 0·28 per cent. vanadium the proportional limit has been increased to 68 per cent.; the proportional limit of the corresponding steels without vanadium is only about 58 per cent.

Vanadium also increases the wear resistance of wheel tyres and of rails. Maximum wear attainable with a laminated perlitic structure is obtained by the interposition of hard carbide between the perlite laminations, such as is caused by the addition of vanadium. Suitable vanadium steels contain about 0·75 per cent. carbon, 0·45 per cent. manganese, 0·54 per cent. silicon and 0·34 per cent. vanadium. Vanadium steels of suitable composition can also be used for the manufacture of boiler plates. Steels containing 0·10 to 0·20 per cent. carbon, 0·50 to 0·80 per cent. manganese, and 0·15 to 0·25 per cent. vanadium are characterised by a much higher heat resistance than ordinary carbon steels used for boiler plates, the resistance range extending up to about 1,100° F. The vanadium carbide is dissolved by thermic treatment of the steel; the plates are finish rolled at temperatures of about 1,800° F. and are then cooled in air, or, if possible in oil or water. The following table shows the mechanical properties of vanadium steel boiler plates of this general composition:—

	Normal annealing at 1,650° F.	Quenched in water from 1,750° F.
Yield point, lb. per sq. in.	43,000	57,000
Tensile strength, ,, ...	58,700	77,000
Proportional limit, per cent. ..	75·5	74·0
Elongation (l = 5d) ,, ..	25·0	12·0
Contraction, ,, ..	55·0	35·0

It is generally known that boiler plates are gradually embrittled by the fluctuating operating temperatures between 400 and 750° F. This process is known as ageing and is due chiefly to the precipitation of nitrogen and carbon. Addition of vanadium to the plate steel prevents the ageing reactions, as the affinity of vanadium for oxygen and nitrogen prevents the separation of these constituents from the metallographic structure of the steel.

Chromium-Vanadium Steels

Very important, particularly for railway purposes, have become the chromium-vanadium case-hardening steels, which are standardised in a number of countries, including the U.S.A. Three types of these alloys are manufactured in Germany as shown in the following table:—

Steel No.	Carbon Per cent.	Manganese Per cent.	Silicon Per cent.	Chromium Per cent.	Vanadium Per cent.
1	0·25–0·40	0·40–0·70	0·40	0·90–1·20	0·10–0·20
2	0·40–0·60	0·40–0·70	0·40	0·90–1·20	0·10–0·20
3	0·50–0·55	0·60–0·90	0·40	0·90–1·20	0·10–0·20

These steels are annealed at 1,300 to 1,350° F. and cooled down slowly within the annealing furnace. The subsequent

treatment depends on the intended application of the parts and is shown by the following table :—

Steel No.	Hardening Temp. ° F.	Quenching in—	Annealing Temp. ° F.	Applications
1	1,470–1,510	Water or oil	930–1,200	Driving axles, piston rods, front axles, crankshafts and pins, wagon axles
2	1,470–1,510	Oil	480–840	Oil-hardened gear wheels, worms, &c.
3	1,470–1,510	Oil	790–895	High grade locomotive springs

The vanadium content of the chromium-vanadium steel raises the fatigue limit considerably, which is a considerable advantage especially for springs, ball and roller bearings, and many other parts exposed to similar types of stresses in railway engineering. The structure of these steels is exceedingly fine and uniform, and does not exhibit segregation phenomena and carbide concentrations such as are hard to avoid in ordinary chromium steels containing no vanadium. A very satisfactory spring steel is produced by adding molybdenum and vanadium to high grade steels, a typical composition of this type being : 0·40 per cent. carbon, 1·50 per cent. chromium, 4·20 per cent. nickel, 0·40 per cent. molybdenum, and 0·30 per cent. vanadium.

The following table shows the compositions chiefly used in Germany for the parts indicated :—

Steel No.	Carbon Per cent.	Manganese Per cent.	Silicon Per cent.	Chromium Per cent.	Nickel Per cent.	Vanadium Per cent.	Applications
1	0·10–0·15	0·30–0·60	—	0·25–0·40	—	0·15–0·40	Coupling pins
2	0·15	0·25	—	0·30	—	0·12	Gearwheels
3	0·10–0·15	<0·60	<0·35	0·60–0·90	—	0·10–0·20	Gearwheels, pins
4	0·12	0·46	0·17	0·62	0·53	0·18	Gearwheels under maximum stresses
5	0·14	0·52	0·22	0·53	0·48	0·19	Gearwheels under maximum stresses
6	0·15–0·25	0·50–0·80	—	1·00	0·50	0·20	Large plate wheels
7	0·09–0·18	<0·50	<0·35	0·80	4·50	0·10–0·20	Gudgeon pins, ball-bearing races

Numerous tools used in railway construction, such as compressed air chisels for the cleaning of castings, hand chisels, and other tools for working natural and artificial stone material, can be made from steels containing 0·3 to 0·4 per cent. carbon, 4·0 to 4·5 per cent. nickel, 1·1 to 1·5 per cent. chromium, 0·8 to 1·1 per cent. tungsten and 0·2 per cent. vanadium. It is possible in these steels to replace a large percentage of tungsten by vanadium. The tools are quenched from 1,560 to 1,650° F. and annealed at 540° F.

Steels used for the manufacture of measuring implements such as calipers, gauges, &c., particularly for heavy work requiring considerable resistance to corrosion and mechanical wear as well as a minimum coefficient of linear expansion, are composed as follows : 0·1 to 0·2 per cent. carbon, 7 to 10 per cent. nickel, and 18 to 20 per cent. chromium ; or 0·1 to 0·4 per cent. carbon and 36 per cent. nickel ; or 0·15 per cent. carbon, 1·0 per cent. nickel, 1·5 per cent. chromium and 1·00 per cent. aluminium.

Hard-facing Steel Surfaces

Advance in welding processes, particularly in electric welding, has brought some exceedingly valuable innovations such as the hard-facing of steel surfaces by which metal of exceptional hardness can be welded on worn surfaces of locomotive and wagon wheels, rails of all kinds, and points and crossings ; the parts can then be re-shaped to the true original dimensions without serious trouble, while in some instances these repairs can be effected even without removing the section affected. Frankenbusch, in a paper read before the German Acetylene Society and the Society for Autogenous Metal Treatment (Frankfort-on-Main, July 1-4, 1937) pointed out that rails exhibiting strong slipping marks, fractures, and exfoliation could be repaired satisfactorily without subsequent milling and grinding of the repaired places by means of autogenous welding.

There are now six groups of hard metals suitable for hard-facing steel surfaces according to E. Ammann,* while in many instances the two cheapest types of these hard metals, the Diaweld and the Composite Rod, will yield satisfactory results. The Diaweld rods are cast from iron-chromium-manganese alloys, the same as the Composite Rods, in which tungsten-carbide grains of $\frac{1}{4}$ in. to $\frac{1}{2}$ in. thickness are imbedded. These rods usually are 10 to 12 mm. ($\frac{5}{12}$ to $\frac{1}{2}$ in.) thick. The chief advantage of this group of alloys is its relatively low welding temperature combined with maximum hardness and wear resistance. The Stellite group of hard-facing alloys consists of cobalt-chromium-tungsten alloys containing occasionally molybdenum and vanadium. The surface produced with this material is resistant to rusting and scaling and maintains its hardness of 40 to 60 Rockwell-C up to temperatures of about 1,300° F. Stellite hard-facing is particularly suited therefore for repairing parts subjected to high temperatures.

Inspection and Testing Developments

The modern development of materials and methods of production and application of materials has been accompanied by a similarly rapid development of physical methods of studying and testing of ferrous and non-ferrous construction metals. Much attention has been paid particularly to the X-ray and Gamma-ray methods of testing, which apart from the accurate and reliable results obtained do not require the destruction of the test pieces for analysis, as is necessary for all chemical and mechanical tests. All internal faults such as blow holes, hardness cracks, pores, and inclusions are determined reliably. While these methods have become generally known and can be studied in a number of publications, a very recent innovation is the ultra-sound wave method of testing carried out with the Defectoskope developed by Sokolo.† Methods for the testing of magnetic ferrous alloys are the magneto-acoustic and the Ferroflux methods described by H. Riebensahm.‡ In the Ferroflux process the magnetised part is covered with petroleum (paraffine) containing finely distributed iron particles. Concentrations of the latter at any point of the steel surface indicate faults, although according to O. Holtschmidt these concentrations of iron particles may be occasioned also at cold worked points entirely free from internal faults, so that in its present state of development this method may lead to errors of judgment.§ Surface examinations of metallic specimens including polished surfaces, welding worms, and so on are reliably carried out with the aid of microscopes such as the surface tester developed by the Emil Busch A.G., Rathenow, and the works material microscope of the Fuess type (Berlin-Steglitz).

* E. Ammann, "Anwendung der Auftragsschweissung von Hartmetallen auf Arbeitsstücke und Werkzeuge," VDI-Verlag, 1934

† "Stuttgarter Industrieblatt," 1938, p. 73

‡ "Werkstoffprüfung" (Metalle), Verlag Julius Springer, 1936

§ "Eigenartige Erscheinungen bei der magnetischen Werkstoffprüfung," VDI-Zeitschrift, 1937, p. 862

AUTOMATIC TRAIN CONTROL ON L.M.S.R.

Intermittent inductive apparatus installed at 112 *distant signal locations on Southend line*

ABOUT six years ago the L.M.S.R., wishing to make the observation of signals easier to drivers, especially in bad weather, decided to experiment with A.T.C. apparatus, and eventually selected the Hudd intermittent inductive system for the purpose. The equipment, which has undergone a number of alterations since the experiments began, has been operating very satisfactorily for some time past, and, by the courtesy of Mr. A. F. Bound, Signal & Telegraph Engineer, L.M.S.R., we recently inspected a complete set of apparatus in operation at Bow works, where much of the experimental work has been carried out in a specially equipped laboratory.

General Principles

The apparatus works on the inductive principle, without any contact between the locomotive and track equipment, and is at present applied to distant signals only. On a locomotive approaching a distant signal in the "off" position, a short blast is sounded on a horn in the cab, which serves as a proof that the mechanism is in order as well as an indication of the proximity of the signal. If the latter is "on," however, the horn continues sounding until stopped by the driver pressing a hand plunger, and, if not stopped after a brief interval, a brake application is also initiated which, if the driver takes no action, will stop the train within the regulation braking distance; this action, although powerful, is well graduated, and no discomfort would be experienced by passengers.

Track Inductors

At a distance of 220 yd. in rear of the distant signal a permanent magnet measuring 24 in. × 6 in. × $1\frac{1}{8}$ in., of Alnico steel, about 250,000 to 280,000 Maxwell lines, is placed longitudinally in the centre of the track, with its top surface 1 in. above rail level and the S pole pointing towards oncoming trains; it is so fixed that unauthorised persons cannot remove it. At a distance of 20 yd. further—to be reduced to 10 yd. in later work—an electromagnet is similarly fixed and wound to a resistance of 16 ohms in such a direction that when excited at 12 volts a powerful field is created, the N pole of which is towards oncoming trains, the reverse of that given by the permanent magnet. The circuit to a controlling relay at the electromagnet (see Fig. 1) is led from a source of power in the signal box through a reverse contact-maker on the distant signal lever and an "off" contact on the distant signal arm (the latter, however, being temporarily omitted for experimental purposes) so that the winding is energised only when the "clear" signal indication is intended to be given. Under all other conditions the electromagnet is dead. The arrangement is the same at all distant signals, whether isolated or under stop signals.

For the signals on the Southend line, where the equipment has been installed at 112 signal locations, accumulators, trickle charged from mains, are used and the electromagnet is continuously excited while its distant signal is "off," but when primary batteries are to be used, as they must if the apparatus is installed where no mains exist, two short lengths of insulated rail will be provided in the vicinity of the electromagnet, to switch it on and off as traffic passes, thus economising battery power. The inductors, as the permanent and electromagnets are called, are protected from the weather and may have protecting ramps to safeguard them against damage from dragging equipment, if desired. None has been experienced as yet, but the use of water scoops on some sections may necessitate precautions. The present equipment begins at Campbell Road Junction, Bow, and extends to the Shoeburyness terminus, a distance of nearly 37 miles.

The accompanying diagram, Fig. 1, shows the conditions of the magnetic fields radiated by the inductors for the "on" and "off" positions of the signal. At a motor-worked distant signal, the electromagnet inductor is energised from its controlling line relay.

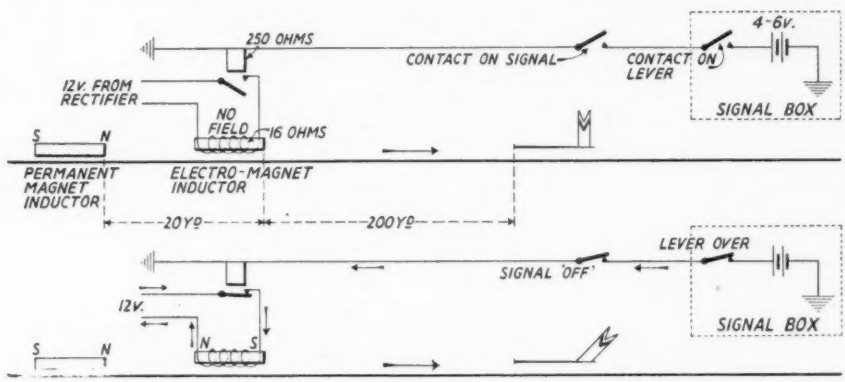

Fig. 1—Diagram showing condition of inductors when signal is "on" and "off" respectively

Locomotive Equipment

The locomotive carries a receiving unit, to pick up the fields of the inductors and transmit the effects they produce to the train controlling mechanism. It consists of an iron collector plate, carried normally 4 in. above the surface level of the inductors (5 in. above rail level), leading the magnetic field picked up by it to pole shoes, between which can turn a permanent magnet armature, about 2 in. square, made of 35 per cent. cobalt steel and mounted in small ball bearings served with non-freezing grease. A slotted tail piece, solid with the armature, controls a button valve, keeping it closed in its normal position. The armature will remain in whatever position it is moved into, under the influence of the magnetism induced by the receiver passing over an inductor, until moved in the reverse direction by the same or an equivalent action. A small electro-magnet energised when the driver presses the resetting plunger in the cab pulls the armature back to the normal position after it has been actuated by passing over the permanent magnet inductor.

The receiver is contained in a watertight casing of non-magnetic steel—bronze is to be used in new work—and supported on bolts to a framework in such a way that

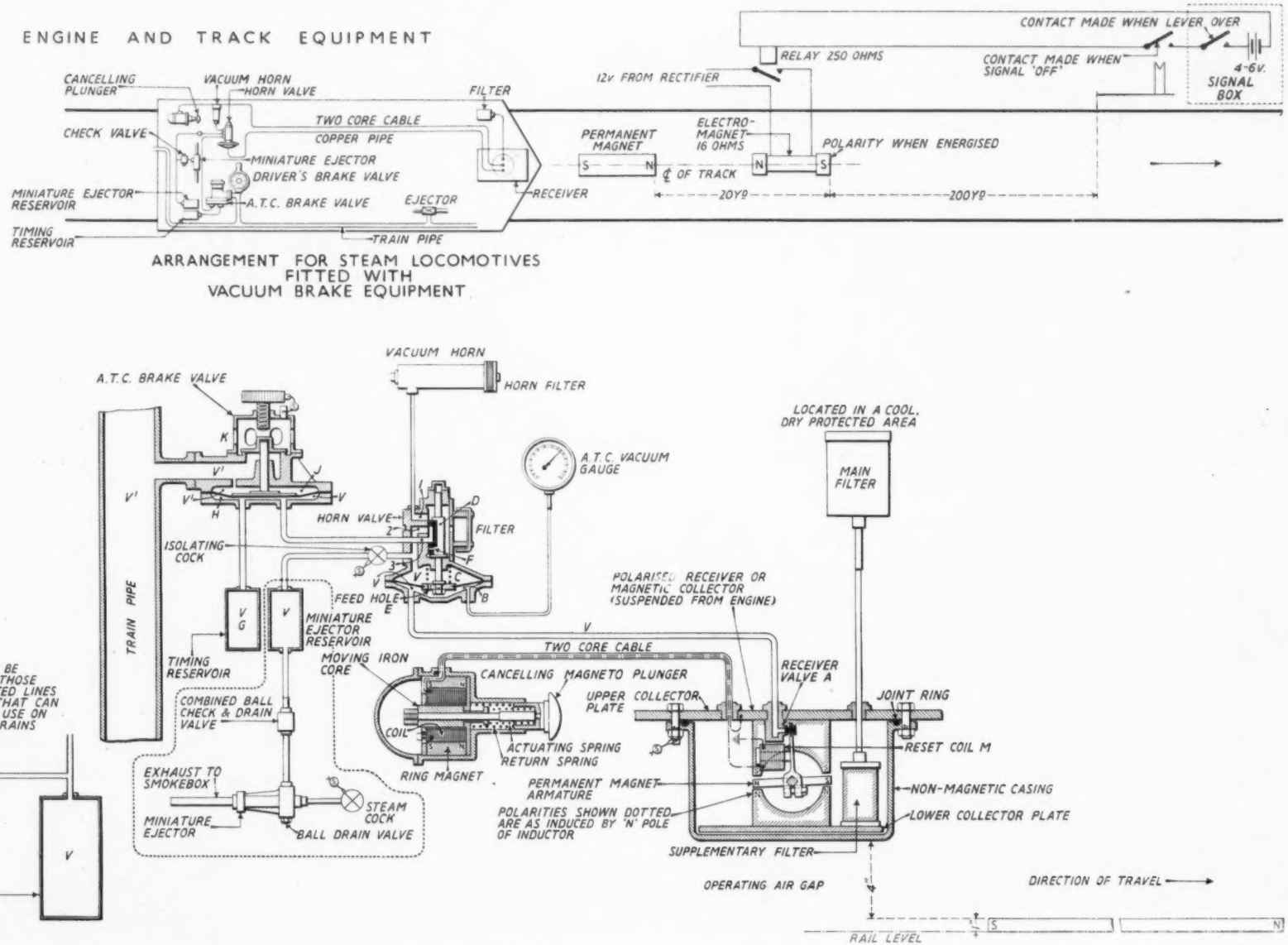

Fig. 2—General arrangement of locomotive and track apparatus for A.T.C. system, L.M.S.R.

should it strike an obstacle the bolts will give way without damage to the receiver mechanism. Severe tests have shown the unit to be impervious to moisture and totally unaffected by extremes of heat or cold. It has been proved possible to actuate the armature reliably with an 8-in. air gap, and the service gap of 4 in. therefore gives a very high margin of safety.

The accompanying Fig. 2 shows the assembly of the apparatus on the locomotive, and it will be seen that the receiver valve above mentioned is at the end of a pipe communicating with one chamber of a diaphragm valve called the horn valve.

Normally the areas marked *V* are maintained at 23 in. of vacuum by a miniature ejector, which is always at work when the locomotive is in service. The areas marked *VI* are maintained under 21 in. of vacuum by the ordinary brake equipment, as usual. In this condition the slide valve *D*, attached to the diaphragm of the horn valve, is in its lower position, establishing a connection to the underside of the diaphragm of the A.T.C. valve *K* and the so-called timing reservoir *G*, so that the latter valve is kept on its seat and there is no path from atmosphere to the train pipe. The pipe from the vacuum horn is connected to atmosphere. This is the normal running condition of the apparatus.

When the locomotive passes over the permanent magnet inductor, the magnetism induced from its S. pole in the receiver tends to hold the armature in the normal position, but when the effect of the N. pole is felt the polarities induced through the collector pieces cause the armature to move and open the receiver valve. This reduces the vacuum beneath the diaphragm of the horn valve, which rises and moves the slide valve *D* up to connect ports *1* and *2*, so that air enters through the horn and causes it to sound. If the locomotive now passes over the electro-magnet and this is energised because the signal is at "clear," the magnetism received from the S. pole will restore the armature of the receiver and close the receiver valve. Vacuum being restored under the diaphragm of the horn valve, the latter is reset to normal, silencing the horn.

If, however, the signal is at "caution," the electro-magnet will be de-energised and produce no effect. The horn will therefore continue to sound and air will pass *via* the orifice *F* and slide valve port *3* to the lower chamber of the A.T.C. valve and the timing reservoir. The balance of pressure in the A.T.C. valve will be upset within 3 sec. of the sounding of the horn, causing the valve to lift and admit air to the train pipe and apply the brake. The purpose of the timing reservoir is to enable the action of the A.T.C. valve to vary with the length of the train and prevent a violent and sudden destruction of vacuum with short trains or light engines. A full destruction of vacuum is produced in about 22 sec. for any length of train.

To stop the sounding of the horn and cancel the brake application, if started, the driver presses the cancelling plunger. This actuates a magneto device, the pressing of

Fig. 3—Permanent magnet inductor in foreground, followed by electro-magnet inductor; signal in distance

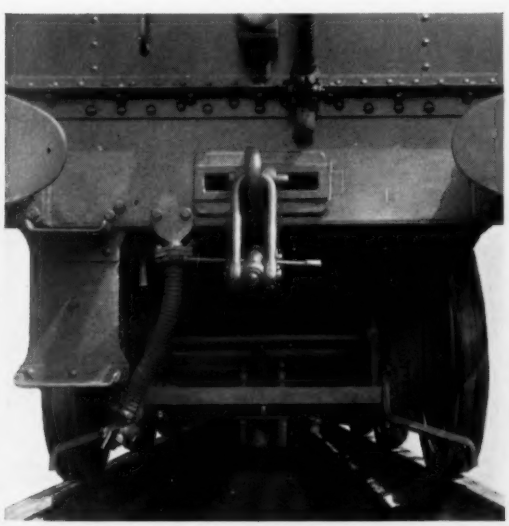

Fig. 4 (left)—Receiver unit attached beneath locomotive.

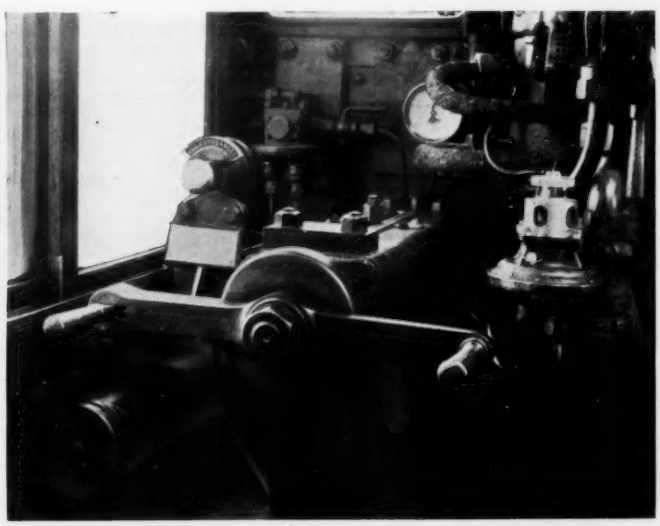

Fig. 5 (right)—Apparatus in cab, showing cancelling plunger on left, and A.T.C. valve on right, with vacuum gauge

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the knob loading a spring behind a plunger core moving in a winding surrounded by a ring permanent magnet, a pole plate at one end normally holding the core. Directly the spring loading reaches a certain pressure the core is propelled rapidly forward and a current induced in the winding, the circuit of which includes a resetting electro-magnet in the engine receiver, the armature of which is pulled back to its normal position. The push can therefore act only momentarily and it is useless for the driver to keep it pressed in. It also has the advantage of dispensing with any source of electric energy on the locomotive.

It will be clear from the above that the apparatus would work just as well if the inductors were sunk vertically, presenting a single pole to the train apparatus, but the longitudinal arrangement enables wrong line working to be carried out without taking special measures. When a locomotive passes over the permanent magnet in the wrong direction at low speeds, say up to 15 m.p.h. or so, a very short sound on the horn is heard, but at higher speeds none at all, the operation and restoration of the receiver armature occurring too rapidly to allow of it.

Equipment for Vacuum-fitted Trains

The arrangement just described, using a miniature ejector is suitable for all classes of locomotive, including those having the steam brake vacuum-controlled, but the ejector can be dispensed with and a vacuum reservoir substituted, as shown separately on Fig. 2, on locomotives that will be run only on vacuum-fitted trains, for which the driver must necessarily bring the vacuum brake into use. Both arrangements are in regular service. Great care is taken to ensure that all air entering the apparatus is thoroughly filtered to exclude particles which might affect the working. The electric cable connections are made through pin and socket, and cone-grip joints, on the principle used for steam piping, and have proved entirely satisfactory.

To put the apparatus out of service, in case of absolute necessity, the milled-head screw on the top of the A.T.C. valve is unsealed and screwed down tight to hold the valve closed, while a sealed isolating cock is provided in the feed pipe from the miniature ejector, or vacuum reservoir, as the case may be, to cut the horn out of action if necessary.

There are 32 locomotives fitted at present, and equipment for 80 more is in hand. In all cases it works with the vacuum brake, although 11 locomotives on the Tilbury line have dual brake apparatus. Designs for adapting the system to air brakes have, however, been drawn up.

Testing and Maintenance

As a locomotive leaves the sheds it passes over a permanent magnet inductor emitting a field intentionally made weaker than that issuing from the ordinary type, to which the apparatus on the engine must respond, the driver then using the cancelling plunger; this ensures the certainty of its doing so at the regular locations. When passing into the shed a short sound on the horn is heard, no action on the driver's part being required. The shed fitters would normally attend to the locomotive equipment, but no special maintenance is being given to it at present with the object of giving it as severe a trial as possible. The track equipment is dealt with by the signal linemen.

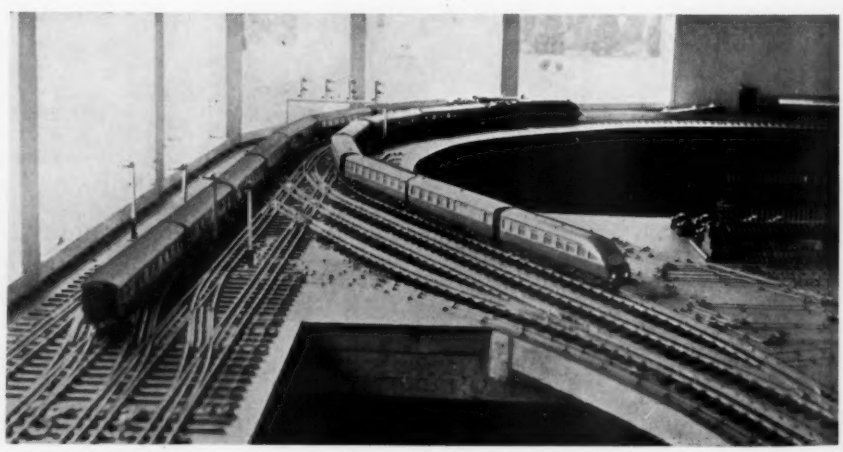
Practical Results

The results obtained so far have fully answered expectations, no difficulties having arisen due to winter conditions; also no interference is experienced when locomotives run over sections equipped with power rails in the centre of the track, and the apparatus can be used on lines fitted with third rail or overhead electric traction equipment without modification.

RAILWAYS IN MINIATURE AT GLASGOW

Famous British trains on working model railway at the Empire Exhibition

THE practice of naming important express services, and of imparting further individuality to them by distinctive design and appointments, is creating in the general public a desire to see these trains for themselves that a few years ago would have been found only among railway enthusiasts. However, the ordinary person's enthusiasm may be damped at the idea of having to visit scattered termini at different hours of the day, so he is sure to welcome the facility now accorded to him in the British Railways Pavilion at the Glasgow Empire Exhibition. Here he can see in motion at the same time, and on a miniature scale that is a source of fascination in itself, famous expresses of the four main-line companies. Various aspects of modern British railway practice are represented—streamlining by the L.M.S.R. Coronation Scot and the L.N.E.R. Coronation; an express of conventional appearance but with distinctive passenger accommodation by the G.W.R. Cornish Riviera; and a multiple-unit electric main-line train by a Southern Railway corridor set as used on the Waterloo—Portsmouth line. The latter is a six-coach train consisting of



L.N.E.R. Coronation train (right) approaching terminus after making circuit of track. The G.W.R. Cornish Riviera is leaving the sidings on left ready for a run

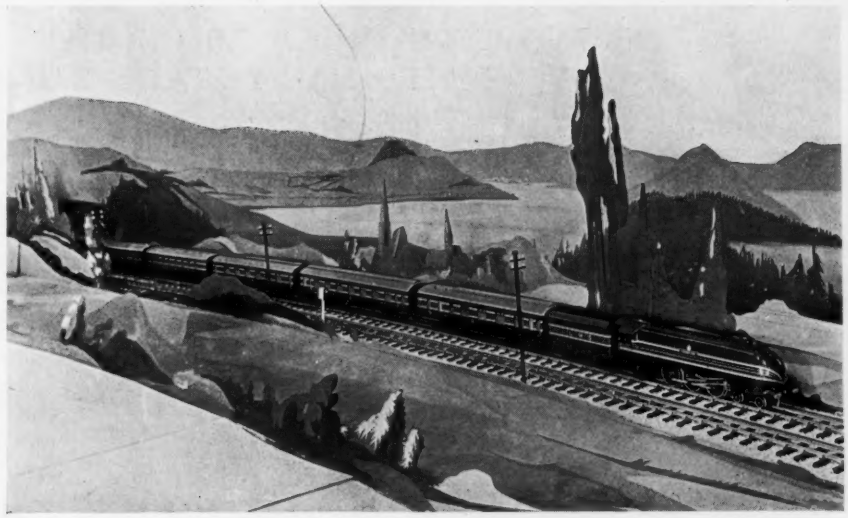
two motorcars coupled together at the centre, each with two trailers attached. There are also goods trains composed of representative types of wagons and hauled by models of an L.M.S.R. standard Class 4F and L.N.E.R. Class J32 0-6-0 locomotives.

All these models are by Bassett-Lowke Limited, Northampton, which firm also supplied and installed the 650-ft. gauge "0" track on which they run, together with all control appliances and signalling.

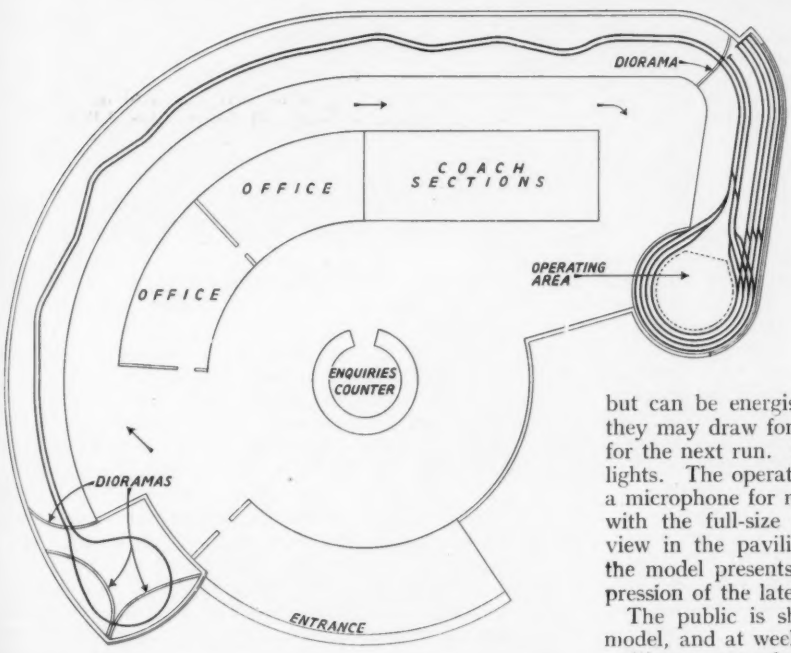
Our plan of the layout shows how the lines follow the walls of the pavilion for most of their perimeter, passing for 150 ft. through a diorama representing the most attractive types of coastal and inland scenery visible on different parts of the British railway system. A section of the diorama can be seen from outside the pavilion. Siding accommodation is provided at the operating end, for storing the trains in readiness to begin their journeys round the hall. A circuit of the layout occupies about 2½ min., and trains can be despatched at one-minute intervals. While they are in motion, shunting operations can be carried out independently at the terminal end.

The trains are electrically operated, taking current from a third rail. Current comes from the Glasgow a.c. mains, but is rectified and reduced to 12 V. d.c., for working the models. To avoid losses caused by the resistance of the lengthy track, power is fed in at three points, and the sections concerned have individual rheostats for speed control at the operating end. All control switches, and the lever frames for points, and the semaphore signals (two of which are electrically worked) at the terminus are grouped conveniently for the operator. On returning to the terminus, the trains enter a section that is normally "dead," but can be energised by depressing push-buttons so that they may draw forward into their respective sidings ready for the next run. Other signalling is by automatic colour-lights. The operator has before him a train diagram, and a microphone for making announcements. In conjunction with the full-size sections of passenger rolling stock on view in the pavilion (described in our issue of May 6), the model presents to visitors a remarkably complete impression of the latest British railway practice.

The public is showing much interest in this elaborate model, and at week-ends it is frequently necessary for the waiting queue of spectators to be formed up round the outside of the pavilion. On these occasions the announcing microphone comes into use for keeping the crowd on the move, so that those outside can be admitted without undue waiting. The model is in charge of Mr. G. L. Lake, of Bassett-Lowke Limited, and we are indebted to him for being able to make a thorough inspection of it during a recent visit to Glasgow.



Above: L.M.S.R. Coronation Scot model passing through a section of the diorama representing Lakeland scenery



Left: Plan of layout, showing it in relation to other exhibits in the British Railways Pavilion

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STEEL ROLLING MILL LIGHTING.—The steel rolling mill at Eastleigh of the Pirelli-General Cable Works Limited is now illuminated by Osira electric discharge lamps incorporating high-pressure mercury-vapour lamps. The whole electrical installation for the mill and its lighting, with the exception of a few special items, was supplied by the General Electric Co. Ltd. The Osira lighting consists of twelve 400-watt Osira lamps mounted 32 ft. above floor level in G.E.C. dispersive reflectors with Saaflux tops. The units are arranged in two rows of six, with 40-ft. spacing between the lamps.

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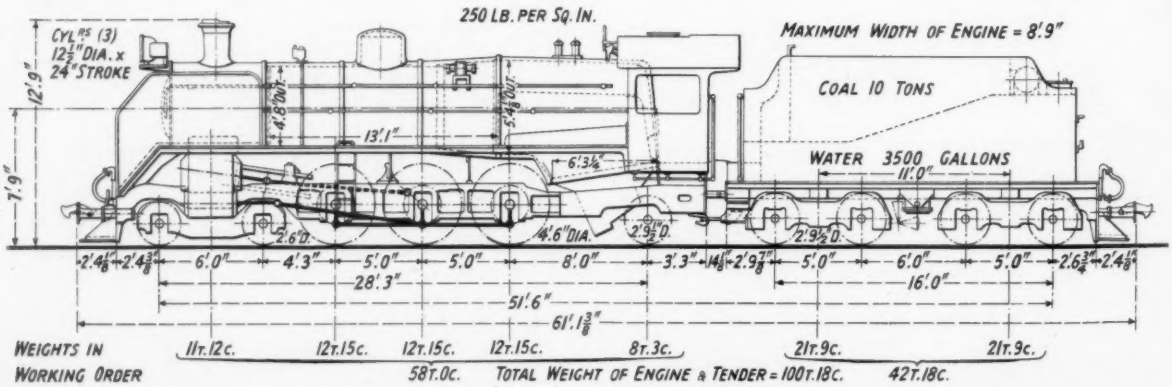
NEW THREE-CYLINDER LOCOMOTIVES FOR THE FEDERATED MALAY STATES RAILWAYS

These engines, built by the North British Locomotive Co. Ltd., are of the 4-6-2 type, specially designed for axle-loads not exceeding 12¾ tons

THE North British Locomotive Co. Ltd., which received an order last year for eleven locomotives for the Federated Malay States Railways, has already dispatched several of the engines to the Colony. Built to the designs of the Chief Mechanical Engineer, Mr. W. F. Wegener, and under the supervision and inspection of the Crown Agents for the Colonies, the locomotives are of the 4-6-2 type, specially designed for axle-loads not exceeding 12¾ tons.

The engines have three single-expansion cylinders, all driving the second pair of coupled wheels, and steam distribution by A. L. E. rotary cam (R.C.) poppet valve gear. The frames are of solid rolled steel slabs well stayed throughout their length, and the coupled axleboxes are fitted between parallel shoes without wedges. The bearing springs of the coupled wheels are overhung, and the links are in tension. The leading and driving springs, and the trailing and truck springs are compensated in two independent groups. The bearing springs are laminated and overhung, and the side movement is controlled by laminated springs.

The boiler shell is of high-tensile nickel steel, consisting of a barrel made in two rings, of which the rear one is tapered. It has an external diameter of 4 ft. 8 in. on the parallel portion, increasing to 5 ft. 4⅛ in. at the throat plate; the distance between tubeplates is 13 ft. 1 in. The round-top firebox is 6 ft. 5⅛ in. long outside by 5 ft. 4 in. wide at the foundation ring. The inner firebox is of steel and is extended forward to form a combustion chamber. Steel water space stays are fitted, with flexible ones in the breaking zone. The first three rows of crown stays are also flexible to allow for expansion of the firebox. Large and small flue tubes are of steel. The main steam pipe inlet is situated in the dome and is not provided with a stop valve. An M.L.S. 21-element multi-valve superheater is provided. The rocking firegrate has a drop



Outline drawing showing principal overall dimensions and weight distribution of F.M.S. 4-6-2 locomotives

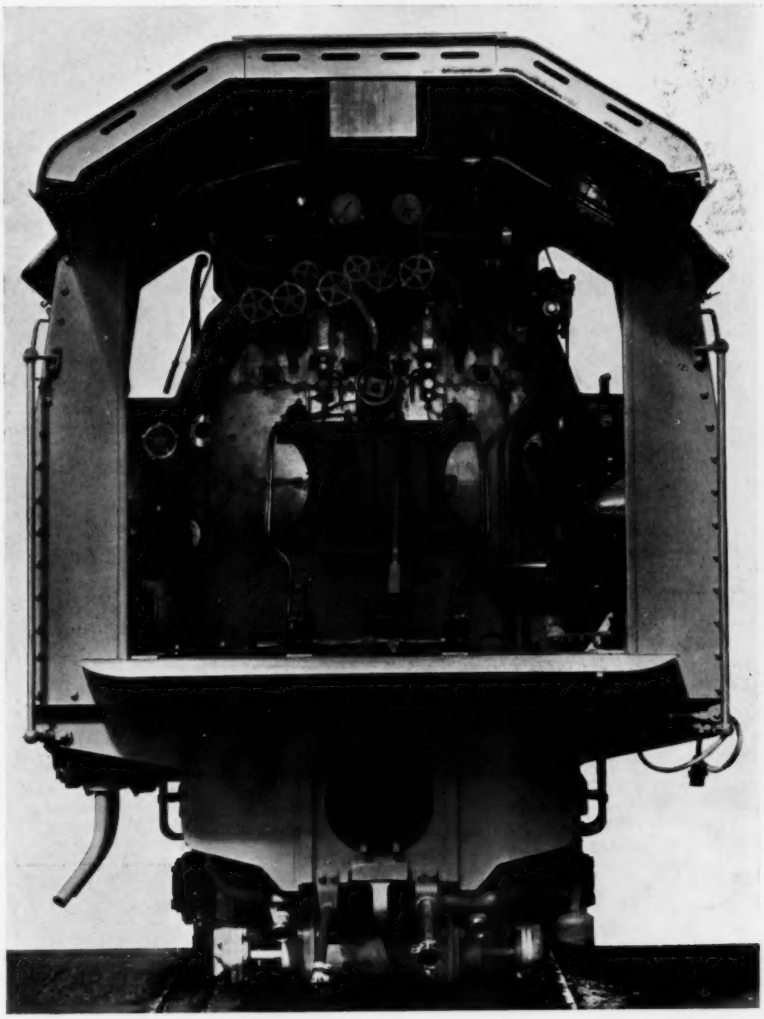
plate at the front end, and the ashpan is of the hopper pattern. Davies & Metcalfe live steam injectors deliver to top-feed clackboxes near the front end of the boiler barrel; other fittings are Ross pop safety valves, Diamond soot blower, Wakefield mechanical lubricator, Lambert wet sanding, asbestos lagging for firebox, Stone-Deuta speed indicator and Stone's electric lighting equipment. Ten engines are fitted with spark arresters of the wire netting type, and one engine with a Cyclone spark arrester.

The following are the main particulars:—

Cylinders (3) dia.	12½ in.
Piston stroke	24 in.
Wheels, bogie, dia.	2 ft. 6 in.
„ coupled, dia.	4 ft. 6 in.
„ truck, dia.	2 ft. 9½ in.
„ tender, dia.	2 ft. 9½ in.
Wheelbase, coupled	10 ft. 0 in.
„ total, engine	28 ft. 3 in.
„ total, engine and tender	51 ft. 6 in.
Heating surface:—	
Small tubes	582 sq. ft.
Large tubes	378 „
Firebox and arch tubes	149 „
Total evaporative	1,109 „
Superheater surface	218 „
Combined total	1,327 „
Grate area	27 „
Boiler pressure	250 lb. per sq. in.
Weight in working order:—	
engine	58 tons 0 cwt.
tender	42 tons 18 cwt.
engine and tender	100 tons 18 cwt.
Adhesive weight	38 tons 5 cwt.
Tractive force at 85 per cent. boiler pressure	22,130 lb.
Factor of adhesion	3·87

Grease lubrication on the Ajax system is provided for the coupled axlebox bearings and connecting and coupling rod bushes, while the axlebox guide faces for all axleboxes on the engine and tender are fitted with Tecalemit soft grease nipples. The front bogie and hind truck axleboxes are of the Timken roller bearing type. A Goodall drawbar is fitted between engine and tender, both of which are equipped with P.H. type M.C.A. central couplers. Vacuum brake apparatus operated by Gresham & Craven Superdreadnought ejector, is fitted on the engine and tender—and the latter also has a hand brake.

The tenders are of the double four-wheel bogie type with framing composed of steel sections and plates. The tanks are of fabricated construction and have a capacity of 3,500 gal. Bunker space for 10 tons of coal is provided. The bearing springs are of the laminated type placed over the wheels, and the axles run in Timken roller bearing boxes.



View of cab and footplate fittings

ROBINSON OF ROCHDALE, 1838-1938.—The well-known firm of Thomas Robinson & Son Ltd., of Rochdale, has this year attained its centenary and as a memento of this achievement, of which the company is justifiably proud, an illustrated souvenir-booklet has been produced for distribution to its many friends throughout the world. It sets forth the history of the connection of the family of Robinson with industry in Rochdale onwards from 1813, two years prior to the Battle of Waterloo, when an old ledger records the purchase by William Robinson, the elder brother of Thomas Robinson (the founder of the firm), of timber from a neighbouring estate. William took his brother into partnership in the year 1835, and the latter became sole proprietor in the following year. On the first day of 1838 he, Thomas, took his son into partnership, thus setting up the firm of Thomas Robinson & Son, which was engaged in the manufacture of household joinery. The woodworking machines incorporating the firm's own improvements which were used aroused such interest by their great success that the partners were urged to manufacture these machines for other concerns. This was done, and thus the foundations were laid of the present great engineering firm. In 1883, three years after it had become a limited company, Thomas Robinson & Son Ltd. became interested in the manufacture of flour milling machinery.

The two sides of the firm's activities virtually constitute separate businesses, but it is claimed that Thomas Robinson & Son is not to be regarded as one firm dividing its energies between two industries, but rather as two firms operating under one directorate and fused at the point where their interests converge.

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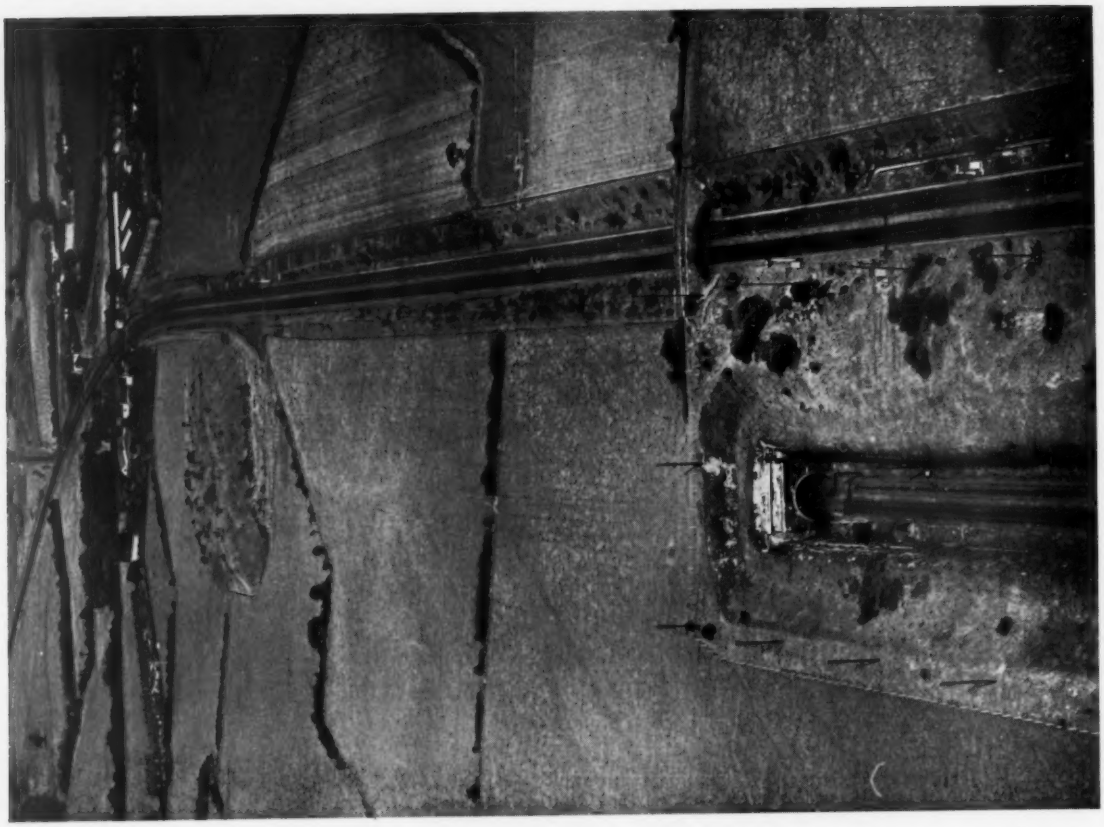
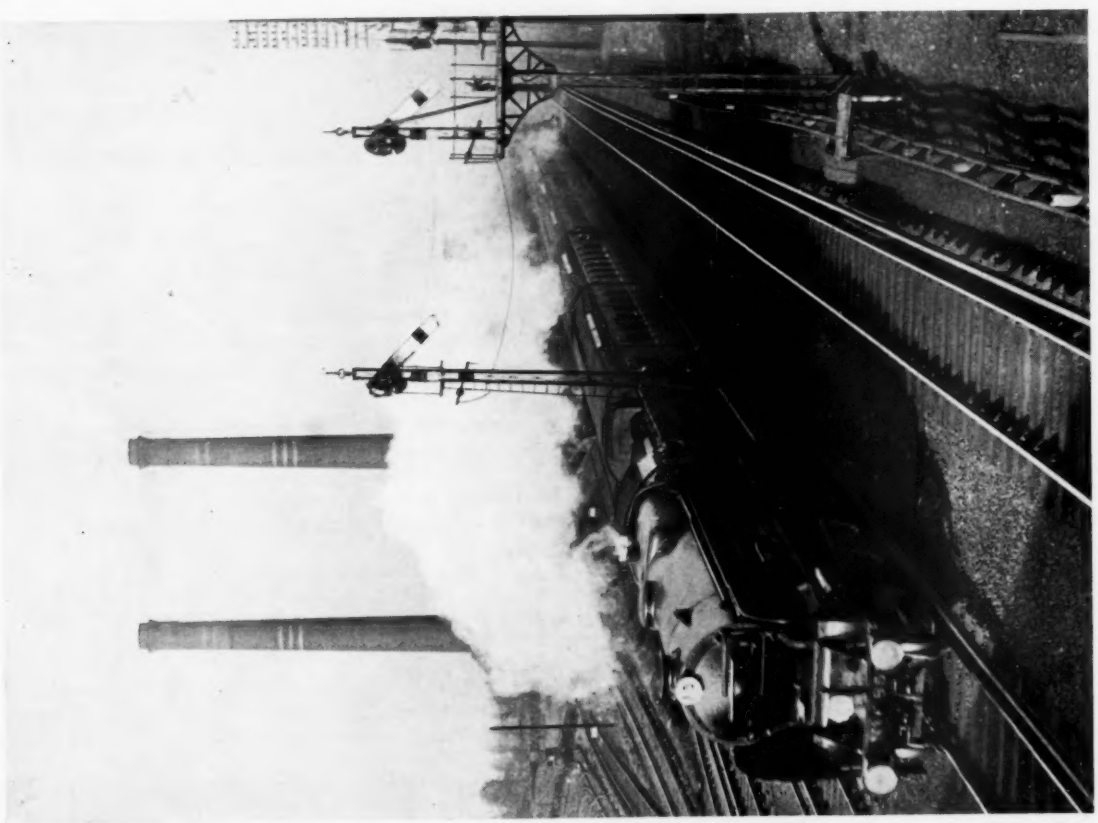


An aerial view of the western entrance to the Severn tunnel, G.W.R. The line on the right is that to Gloucester and Chepstow, from which the London line (through the tunnel) diverges at Severn Tunnel Junction

[Aerial Photographic Company, Photo]



A down Southern Railway express, hauled by a "Lord Nelson" class locomotive, approaching the site of the present Wimbledon flyover. The train is running on what is now the up local line, the tracks having been rearranged

[Wimbledon Boro. News, Photo]

RAILWAY NEWS SECTION

PERSONAL

Mr. N. B. Walton has been appointed a Vice-President of the Canadian National Railways, in charge of operation, maintenance, and construction. Since November, 1936, Mr. Walton has been Chief of Transportation for the whole C.N.R. system.

The executive of the British National Committee of the World Power Conference has appointed Sir Harold Hartley to be the leader of the British Delegation to the Vienna Sectional Meeting of the conference. Sir Harold Hartley is a Vice-President of the L.M.S.R.

The services of Mr. P. W. Craker, an officer of the Indian Railway Service of Engineers, have been lent by the Government of India to that of Burma, for a period of three years, as Government Inspector of Railways in Burma.

We regret to record the death on July 30, at the age of 70, of Major A. C. Chauncy, who retired in 1933 from the position of Chief of Police, London & North Eastern Railway. He had previously occupied a similar position on the former Great Eastern Railway.

Monsieur Lamquet, General Manager of the Upper Congo-Great Lakes Railway, has retired after 34 years' service. He had charge of the construction of the railway, receiving his instructions from Baron Empain on behalf of King Leopold II.

We regret to learn of the recent death of Mr. W. R. Rennick, formerly Assistant Chief Engineer, Way & Works, Victorian Government Railways. Mr. Rennick, who retired in 1924 after 35 years' service, graduated with distinction at Melbourne University in civil and mining engineering, and was first associated with the Melbourne Harbour Trust, where he rose to be Assistant Chief Engineer to that body. Joining the Railway Department, he was selected for various important works, and was one of the original members of the departmental committee concerned with the introduction of the suburban electrification. Mr. Rennick was for many years co-examiner in engineering at the university, and was Secretary of the Institute of Engineers for 14 years.

Monsieur R. Leguille, whose appointment as a Member of the Indian Pacific Locomotive Committee (formed in consequence of the derailment near Bihta, E.I.R., on July 17, 1937), was recorded in our issue of July 29, was a student at the Ecole Polytechnique, Paris, in 1919-20. He entered the former Eastern Railway of France on September 1, 1920, and gained experience on the footplate, in the sheds, and at the locomotive works, where in 1923 he was promoted to the post of Inspecteur in the locomotive drawing office. M. Leguille became Mechanical Engineer of the Est on January 1, 1928, in which capacity he was responsible for the design of steam locomotives and diesel engines, and in charge of locomotive testing. In the latter connection, he designed a special dynamometer car for use on the Est. Since the absorption of all French main lines into the French National Railways Company on January 1 this year, M. Leguille has been chief of the subdivision for locomotive trials, embracing the whole National Railways system. M. Leguille is Chief Mechanical Engineer of the South-Eastern Region of those railways.

Monsieur R. Leguille

Chief Mechanical Engineer, South-Eastern Region, French National Railways; appointed a Member of the Indian Pacific Locomotive Committee

Mr. H. L. Hopkins, Goods Agent, Leeds, Marsh Lane (N.E.) and Hunslet, L.N.E.R., has been appointed Goods Agent, Leicester.

Mr. W. T. James, hitherto Assistant General Manager of the Western Welsh Omnibus Co. Ltd., has been appointed General Manager of the company in succession to Mr. A. Gray, who now becomes Consultant to the company. The Western Welsh Omnibus Co. Ltd. was formerly South Wales Commercial Motors Limited, and adopted its present title in June, 1929, following a comprehensive co-ordination agreement with the Great Western Railway, whereby the G.W.R. acquired a large shareholding interest in the bus company, which took over at that time the many G.W.R. passenger road motor services working in South and Western Wales.

Indian Railway Staff Changes

Rai Bahadur Divakar Dutt has been appointed to officiate as Divisional Superintendent, N.W.R., as from June 2.

Mr. R. L. W. Meehan has been confirmed as Chief Mechanical Engineer, E.B.R.

We regret to record the death at Aix-le-Bains on July 22, at the age of 63, of Sir Nowroji Saklatvala, Chairman of the Tata Iron & Steel, and Tata Power Companies, India. He was President of the Imperial Bank of India, and Chairman of 21 other concerns. He was knighted in 1933, and received the K.B.E. last year. Mr. J. R. D. Tata, has now been appointed Managing Director of the Tata concerns.

Mr. J. R. Sadler, whose appointment as District Passenger Manager, York, L.N.E.R., was recorded in our issue of August 5, entered the service of the former North Eastern Railway as a junior clerk in the Chief Goods Manager's Office in 1910. He worked in various sections of that office, in the District Goods Manager's Office at Leeds, and at a number of stations up to the outbreak of the war, and then served with the 17th Battalion, Northumberland Fusiliers (N.E.R. Battalion) from 1914 until he was demobilised with the rank of Captain

and Adjutant in 1919 (and mentioned in Despatches, 1918). In July, 1919, Mr. Sadler trained as a traffic apprentice, and was engaged chiefly on docks work at West Hartlepool, Blyth, and on the Tyne; and also

Mr. J. R. Sadler

Appointed District Passenger Manager, York, London & North-Eastern Railway

acted as Assistant Yardmaster at West Hartlepool for one year during the training period. In June, 1923, he was appointed Assistant Yardmaster at Darlington and in the following year became Mineral Traffic Controller at Hull. In November, 1936, Mr. Sadler was appointed Chief Clerk to the District Superintendent at Leeds, and was promoted to be Assistant to the District Superintendent at York two years later. In March, 1933, he was appointed Assistant District Superintendent, York, and in July, 1936, became Assistant to the Superintendent (Trains) North Eastern Area, L.N.E.R. Mr. Sadler was in July, 1925, gazetted Captain and Adjutant of Headquarters Docks Group, R.E. (S.R.). In March, 1933, he was appointed to command No. 157 (L.N.E.) Docks Company, R.E. (S.R.), with the rank of Major. Since November, 1936, he has commanded No. 1 Headquarters Docks Group R.E. (S.R.) with the rank of Lt.-Colonel.

From *The London Gazette* of August 5: Regular Army, Supplementary Reserve of Officers, Royal Engineers, Transportation: The following to be Captains (August 6): E. A. Lewis, R. B. Oram, J. S. B. Gentry (late temp. 2nd Lt., Hampshire Regiment).

The following to be Lieutenants (August 6): Lt. H. D. Evans (from Supp. Res. of Off., R.A.S.C.), R. F. Tucker (late Cadet, Monmouth School Contgt., O.T.C.), J. G. Purves (late Cadet Sergt., St. Bees School Contgt., O.T.C.).

The following to be Second Lieutenants: W. R. Carslake, P. N. Phizackerley (late Cadet Lance-Corpl., Aldenham School Contgt., O.T.C.), Spr. J. F. Hull (from 155th (L.M.S.) Rly. Workshop Coy., and late Cadet, Herne Bay College Contgt., O.T.C.), J. C. Oliver (late Cadet Lce.-Corpl., Derby School Contgt., O.T.C.).

Mr. C. G. Harrison, whose appointment as Assistant Chief Mechanical Engineer of the Federated Malay States Railways was recorded in our issue of May 6, was educated in Dublin, and studied engineering as an external student of London University; he received his practical training in locomotive engineering as a pupil of Mr. W. H. Morton at the Broadstone works of the former Midland & Great Western Railway, Ireland, from 1922-25. In 1925 he was appointed Technical Assistant to the Works Manager at Broadstone, where he remained until transferred to Inchicore works, Great Southern Railways, as Junior Assistant (Locomotive) to the Works Manager in August, 1928. From November, 1929, to May, 1931, Mr. Harrison was Carriage & Wagon Assistant to the Works Manager at Inchicore, and in June, 1931,

Mr. C. G. Harrison

Appointed Assistant Chief Mechanical Engineer, Federated Malay States Railways

was appointed Assistant (Locomotive) & Progress Engineer. Mr. Harrison returned to Broadstone as Assistant Works Manager in April, 1933, but in August of the same year those works were closed and all repairs and renewals centralised at Inchicore, where he resumed his former position. Here he was directly responsible to the Works Manager for all locomotive repairs and new construction, with complete control of the locomotive workshops. These shops are highly organised on a progressive system based on that in use at Crewe. Mr. Harrison has served on a number of technical

New station building at Umtali, Southern Rhodesia. The District Engineer and his staff are accommodated in the offices on the first floor (*see Overseas paragraph on page* 289)

commissions, and is Vice-President of the Engineering and Scientific Association of Ireland, to which body he has presented papers on stress analysis by the photo-elastic method, and welding.

L.M.S.R. Appointments

The following appointments have been approved by the directors of the L.M.S.R.:—

Mr. H. E. Horne, Assistant Chief Commercial Manager (Passenger), Euston, to be Acting Assistant Chief Commercial Manager, Euston.

Mr. W. P. Bradbury, Assistant to Chief Commercial Manager (Passenger), Euston, to be Acting Assistant Chief Commercial Manager (Passenger), Euston.

Mr. C. Johnstone, District Passenger Manager, Liverpool, to be Assistant to Chief Commercial Manager (Passenger), Euston.

Mr. H. E. Pedley, Chief Rates & Charges Clerk (Passenger), Chief Commercial Manager's Office, Euston, to be District Passenger Manager, Liverpool.

Mr. G. H. Nutter, Assistant District Goods Manager, Manchester, to be District Goods and Passenger Manager, Stoke.

Mr. H. P. Aggleton, Head of Goods Revenue Section, Chief Commercial Manager's Office, Euston, to be Assistant District Goods Manager, Manchester.

Mr. C. R. Campbell, Assistant, Office of Divisional Superintendent of Operation (Motive Power), Derby, to be District Loco. Superintendent, Carlisle.

Mr. A. R. Ewer, Assistant, Office of Divisional Superintendent of Operation (Motive Power), Derby, to be District Loco. Superintendent, Willesden.

Mr. A. J. Ault, District Signal & Telegraph Assistant, Watford, to be Area Technical Assistant, Watford.

Mr. H. Jones, District Signal & Telegraph Assistant, Lancaster, to be Area Technical Assistant, Manchester (Victoria).

Mr. J. H. Mottram, District Signal & Telegraph Assistant, Birmingham, to be Area Technical Assistant, Rugby.

Mr. E. E. Grinham, District Signal & Telegraph Assistant, Stafford, to be Area Technical Assistant, Warrington.

Mr. W. Dean, District Signal & Telegraph Assistant, Bolton, to be Area Technical Assistant, Bolton.

Mr. H. W. Holt, District Signal & Telegraph Assistant, Nottingham, to be Area Technical Assistant, Sheffield.

Mr. H. C. Dickin, District Signal & Telegraph Assistant, Bedford, to be Area Technical Assistant, Bedford.

Mr. F. C. Dean, District Signal & Telegraph Assistant, Stoke, to be Area Technical Assistant, Stoke.

Mr. J. Harding, District Signal & Telegraph Assistant, Rugby, to be Area Technical Assistant, Bristol (Fishponds).

Mr. F. W. Whittingham, District Signal & Telegraph Assistant, Chester, to be Area Technical Assistant, Chester.

Mr. T. H. Clark, District Signal & Telegraph Assistant, Barrow, to be Area Technical Assistant, Lancaster.

Mr. J. T. Greenhall, Technical Assistant (Estimates), Manchester (Hunt's Bank), to be Area Technical Assistant, Leeds.

Mr. H. Walton, Chief Clerk, Superintendent's Office, Goole, to be Assistant Superintendent, Goole.

Mr. G. E. Curtis, Vice-President's Office, Euston, to be Joint Goods Agent, Keighley (L.M.S. and L.N.E.).

Mr. L. Ebdale, District Coal Traffic Agent, District Goods Manager's Office, Manchester, to be District Coal Traffic Agent, District Goods Manager's Office, Leeds.

Mr. W. C. Keep, Stationmaster, Southend & Southend East, to be Stationmaster, Tilbury, also i/c Tilbury Dock & Gravesend.

Mr. R. A. Buckler, Stationmaster & Goods Agent, Grays, to be Stationmaster, Southend & Southend East.

Mr. J. J. Whalley, Stationmaster & Goods Agent, Preston Road, also i/c Walton Junction, to be Stationmaster & Goods Agent, Bacup.

Mr. H. A. Chapman, Solicitor Assistant (Parliamentary), to be Chief Assistant Solicitor (Parliamentary), Euston.

Mr. C. R. S. Harris, Director-General of the Buenos Ayres Great Southern and Buenos Ayres Western Railways, has returned to Argentina after his recent visit to Europe.

Radio on Norwegian Goods Trains

For about two years past the Norwegian State Railways have been experimenting with wireless signalling apparatus for communicating between guard and driver on the long goods trains running between Trondheim and Storlien. As was explained in describing the apparatus in our issue of October 29 last, its purpose is principally to enable stopping and starting signals to be given during shunting operations at stations. The apparatus is, of course, also useful in an emergency. The signals are acknowledged on the engine whistle as usual. A 20-watt valve transmitter is used, with Morse sending key, and takes its power from the 32-volt lighting battery in the guard's van. The receiver on the locomotive is fed from a 2-4 volt accumulator and a high tension primary battery.

The aerials are 10 m. and 8 m. (33 ft. and 26¼ ft.) long respectively, for sending and receiving on a wavelength of 90 metres. A few technical difficulties have been met with, according to the *Nordisk Järnbanetidskrift*, but the working has given satisfaction, and has enabled appreciable savings to be made, a shunter and the accommodation necessary for him being no longer needed. If the plan is extended it is expected to adopt modified equipment and provide for telephone as well as Morse signalling.

A Durham Railway Centenary

On June 16, 1834, the Durham Junction Railway Company was formed with an authorised capital of £114,000 (£80,000 in shares and £34,000 by loan). Its object was to build a modest 7 miles of railway line from Washington to Moorsley to connect the Stanhope & Tyne Railway with the northern terminus of the Hartlepool Railway, but only five miles of the line —from Washington to Rainton—were actually constructed. Later this five mile stretch became one of the busiest in Great Britain, forming part of the main route from the South to Newcastle until the direct line through Durham and Chester-le-Street was built.

The principal problem that faced the engineers was bridging the River Wear near Low Lambton. It was at first proposed to build an iron bridge of 170-ft. span to carry road vehicles and foot passengers as well as the railway, but this plan was eventually rejected and a stone bridge was built—the contract for which was let towards the end of 1835—and it turned out to be one of the finest engineering works in the kingdom. The design was based upon that of Trajan's bridge at Alcantara; it was strong and simple and was much admired by the mechanical section of the British Association, which met in Newcastle at that time. The bridge cost a little over £40,000 and the last stone was laid on Queen Victoria's coronation day, June 28, 1838. Of the four main spans, two were 100 ft. in length, one 144 ft., and the fourth 160 ft.; the entire length including minor arches at each end was 811 ft.

On August 24, 1838, just one hundred years ago, a party from Newcastle, including distinguished members of the British Association, inspected the bridge and travelled in two trains over the entire length of the line to Rainton Meadows and back, and the line was opened for mineral traffic. Most of the ceremonial occasions in the early days of railways had their incidents and this was no exception. On the return journey the first train stopped at the south end of the Victoria bridge (as it was called in honour of the Queen's coronation) and the second train, which was not sufficiently under control, ran into it; some of the passengers were slightly injured and there was half-an-hour's delay. The serious business of the railway started immediately afterwards when a mineral train of 120 wagons travelled over the line. Passengers were carried on the Durham Junction Railway for the first time on March 9, 1840.

XUM

Replanning Heidelberg Station

Rebuilding on new site is needed to abolish level crossings

An interesting article in *Die Reichsbahn* by Professor Müller, of Freiburg in Breisgau, gives some particulars of the development of the railway layouts at Heidelberg station, which are now taxed to capacity and need entirely rearranging to meet growing requirements. Heidelberg was one terminal point of the first line in Baden, opened from Mannheim in 1840 and continued to Karlsruhe in 1843. This formed part of the later main trunk route to Basle, *via* Offenburg and Freiburg, and the first important State-owned railway system in Germany. As related in THE RAILWAY GAZETTE for January 17, 1936, the State of Baden adopted a gauge of approximately 5 ft. 3 in., after a report from a commission sent to England, France, and Belgium; the Zurich Northern Railway in Switzerland did the same, but changed to standard gauge on amalgamating with the Swiss Eastern Railway Company, so that Baden was compelled to abandon the broad gauge in 1855, the last train over it running on April 15.

Heidelberg station was built as a dead end station, necessitating reversal of trains, and at first consisted of four tracks with two outside platforms. The main lines were single at first and laid with bridge rails on longitudinal sleepers. The main entrance portion of the buildings and some others are still in use. The reversal of trains has led to much greater difficulties than was ever expected, but in 1840 a through station could have been built only in an inconvenient position. In 1843 fourth class carriages, later general in Germany, were introduced but were discontinued ten years later. By 1844 traffic had increased sufficiently to call for better accommodation, and as, in the previous year, Baden, Hesse, and Frankfort, then a Free City, had agreed to construct a line from the last-named *via* Darmstadt to Heidelberg, widening of the station became essential. This was effected by making a duplicate station for the Frankfort line alongside the old one, adding sidings, goods sheds, and other facilities (some used by both lines); there was accommodation for transhipment between the gauges, the new line, which was opened on August 1, 1846, being of the standard gauge as adopted in Prussia. The main Baden line had reached Freiburg in 1845, and was extended to Schliengen in 1847; increased traffic necessitated doubling, and the section from Heidelberg to Karlsruhe was finished by 1848. After 1851, when the Swiss frontier was reached, the disadvantages of the odd gauge in Baden became increasingly felt, and early in 1854 conversion to standard was begun.

The growth of connections with other lines, such as in 1853 and 1869 with the Württemberg State system, and in 1866 with the Bavarian system, called for further improvements. In 1862 the opening of the Odenwald line to Mesbach made a through line in the station, which crossed—as it still does—the lines outside in a very inconvenient manner. New locomotive sheds and workshops were erected, and were in use until 10 years ago. As further enlargement of the station was then out of the question owing to cost, the Baden administration sought to ease matters by building spur lines in 1864 so that a certain amount of north to south traffic could be diverted from the station, especially goods traffic, while the conversion of the two single Frankfort and Baden lines to one common double line between Heidelberg and Friedrichsfeld was also taken in hand. A goods station on a new site was erected in 1873, and removed many traffic difficulties. In that year a new connecting line to Speyer was opened and this crossed other routes, so that the working of the station became more difficult in busy times. Not long after, railway finances in Baden suffered a depression, which again prevented any serious remodelling of the layout. Some structural improvements were, however, made. Signalling arrangements had originally been somewhat primitive, but interlocking, with raised signal boxes, was put in between 1882 and 1885.

The Baden railways at first followed the English plan of running left-handed, whereas Prussia had standardised on right hand working which eventually prevailed throughout Germany. In 1888 Baden began the change over, which involved considerable point and signal alterations. During the nineties improvements in the platforms and awnings were gradually carried out, and the Weinheim narrow-gauge line was connected to the station; eventually the Frankfort and Baden lines portions were worked by agreement as one. The tracks and signals were then altered to some extent. The great growth of traffic gave rise to serious complaint at the delays caused at the level crossings in the town, and once again plans for an entire remodelling were considered, including a new site for the passenger portion of the layout, although there were many objections to such an alteration. A special commission, however, reported in June, 1901, in favour of the removal, and the town accepted its proposals. As they would in any case take a long time to carry out, some benefit was obtained by minor alterations. In 1902 and 1903 funds were allocated to the work, land was obtained, and plans prepared, operations being begun in 1909 and the new goods marshalling yard and approaches finished in March, 1914. Further work was stopped by the war, nothing more being done for nine years. In 1927 the carriage sidings were completed and some old sheds and coaling stages abolished. New signalling was then put in. The old was very out of date, as the intention to rebuild the station had led to its being somewhat neglected and improvement could no longer be postponed.

Staff and Labour Matters

Railway Staff National Tribunal Decision No. 4

The executive of the National Union of Railwaymen met in London on Monday, August 8, to consider Railway Staff National Tribunal Decision No. 4, which deals with rates of pay and conditions of service of signalmen, relief signalmen, and traffic regulators. After a long discussion it was decided to call a special delegate conference to consider the award. The date of the conference has not yet been fixed.

Forthcoming Events

Sept. 8 (*Thurs.*)—Railway Club, at Royal Scottish Corporation Hall, Fetter Lane, London, E.C.4, 7.30 p.m. "The Early History of the North Staffordshire Railway," by Mr. J. Simmons.

Sept. 15-24.—Model Engineer Exhibition, at Royal Horticultural Hall, Vincent Square, London, S.W.1.

Sept. 19-23.—International Management Congress, at Washington, U.S.A.

International Rail Assembly, at Düsseldorf, Germany.

Sept. 30 (*Fri.*).—Permanent Way Institution (Hull). "Permanent Way Institution Convention in Germany, 1938," by Mr. W. A. Willox.

CANADIAN NATIONAL EXHIBITION AT TORONTO.—Canada is keeping an interesting anniversary from August 26 to September 10 this year—the Diamond Jubilee of the Canadian National Exhibition at Toronto. This Exhibition, started sixty years ago as an agricultural fair, now holds the position of being the largest annual exhibition in the world, with an exhibiting area exceeding 2¼ million sq. ft. It possesses some twenty-two permanent buildings set in a park of 350 acres along the shores of Lake Ontario. The British Government has availed itself of the opportunity afforded by this celebration to contribute an official display, the theme of which will be "Communications and Transport." The exhibit is being housed in a separate building which has been provided by the exhibition authorities and adapted to make it the official United Kingdom Government Pavilion. Exhibits in four galleries will illustrate by scale models the developments which have taken place mainly in Great Britain in the design of the principal forms of transport—ships, locomotives, motor-cars, and aeroplanes. In the locomotive gallery the models begin with the famous *Rocket* (built in 1829) and end with the *Coronation* of 1937.

Notting Hill Gate Reconstruction Begins

Subway under road; Escalators to replace lifts

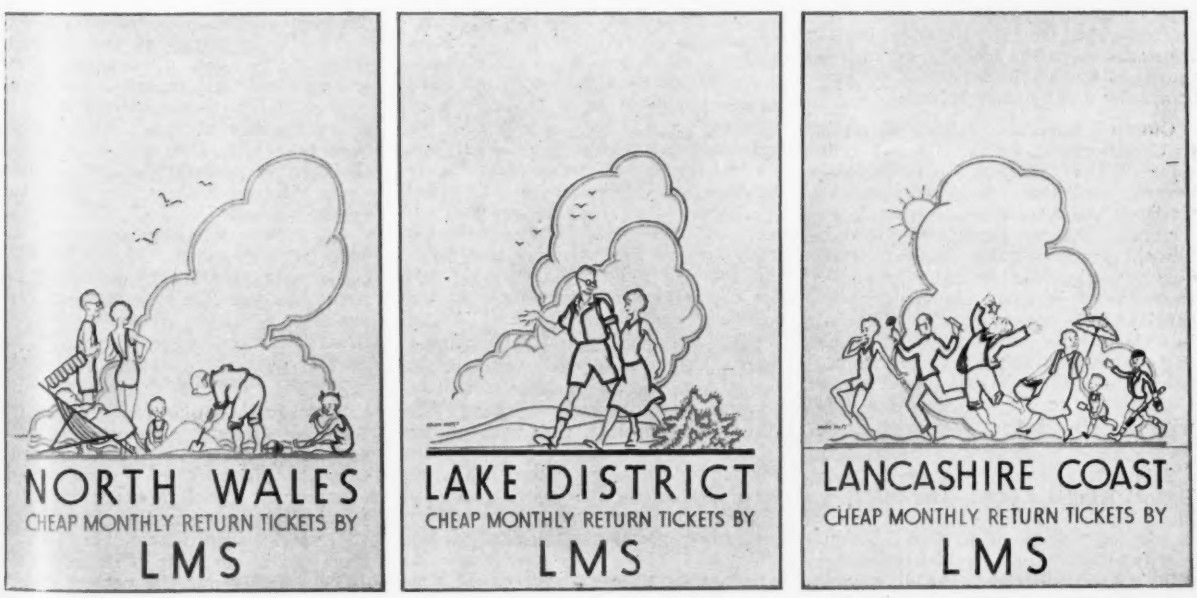
Contractors for the London Passenger Transport Board have begun work on two sites near Notting Hill Gate (Metropolitan and District Lines) station. These are the first steps in a costly programme of improvements which will alter substantially the appearance of this part of London. There are now two London Transport stations at Notting Hill Gate, one for Metropolitan and District trains, and one for Central Line trains. They are on opposite sides of the High Street, and since they are not connected passengers changing from one line to another have to cross the road. The programme provides for a passenger and pedestrian subway under the High Street; for high speed escalators to the Central Line in place of lifts; and for direct interchange facilities between the two lines. In conjunction with the London Transport work, which will cost some £200,000, the London County Council will widen the High Street to eliminate a notorious bottle-neck. The contractors, who have begun to demolish buildings in Jameson Street, are making way for the construction of an electric substation over the Metropolitan tracks. Behind hoardings at the corner of Church Street and the High Street other contractors are sinking a shaft to a depth of 46 ft. from which the lower escalator tunnels and the new interchange passage with the Metropolitan will be driven.

The floor of the new ticket hall will be about 12 ft. below the road surface on the south side of High Street. Passengers to the Central London line will enter the ticket hall either by direct steps or through the subway under High Street. From the ticket hall escalators will carry passengers 24 ft. down to a small circulating area, from which escalators will serve the Central Line platforms 42 ft. and 58 ft. below, the two station tunnels being at different levels. The Metropolitan Line platforms will be 11 ft. below the new ticket hall, and passengers changing from Metropolitan trains to Central Line trains will walk down steps at the end of the Metropolitan platforms into an interchange subway which will communicate with the circulating area from which the escalators will lead to the tube platforms. The new station, therefore, will have five floor levels—the subway and ticket hall 12 ft. below the road; the Metropolitan platforms 11 ft. below the ticket hall; the interchange subway and the circulating area 13 ft. below the Metropolitan platforms; the first Central Line platform 42 ft. below the circulating area; and the second Central Line platform 16 ft. below the first platform. The escalators will be of modern high speed type.

At present some six million passengers use the two stations every year. The works will establish a new exchange point for Underground traffic which should prove of considerable value to passengers. The number of passengers who exchange between the two stations is now less than half a million passengers a year. It is difficult to estimate the probable increase, but at Holborn station, for instance, when the exchange facilities were improved recently, the number of passengers using them increased tenfold.

MORE SNOW PLOUGHS FOR THE L.N.E.R.—The L.N.E.R. is providing five further steel snow ploughs for service on its Scottish lines and, in addition, has decided to convert three existing ploughs which are principally of wooden construction to the latest type of steel construction. When this order is carried out there will be fifteen steel snow ploughs allocated to different parts of the L.N.E.R. in Scotland, and the type of snow plough is such that it can be fitted to a locomotive readily when a fall of snow is threatening, without interfering with the utility of the engine for ordinary traffic purposes. The ploughs are designed to throw the snow to the off-side of the line so that on double-track sections the clearance of either line can be carried out without interference with the opposite track.

L.M.S.R. Posters Displayed on Underground



Three lively L.M.S.R. posters designed for display at London Underground stations, where they bring a little much-needed mirth to subterranean travellers bound to and from the daily round

NOTES AND NEWS

Waterspout Damage to French Railway.—During a violent storm which swept the South of France on Sunday last, fifty yards of the main line railway track from Bordeaux to Cette were damaged by a waterspout.

Fire Damage to Welsh Viaduct.—The pedestrian portion of the G.W.R. viaduct which spans the Mawddach estuary at Barmouth suffered some damage by fire last week; the cause is unknown. The adjacent railway permanent way was not affected.

Glossop & Dinting Station.—The L.N.E.R. announces that the name of Glossop & Dinting station, on the main line between Manchester and Sheffield, is to be altered to Dinting. This alteration is being made to avoid confusion with Glossop Central station, which is at the terminus of a short branch line from Glossop & Dinting station.

First English Railway Milk Bar.—The L.N.E.R. has decided to instal an up-to-date milk bar at Paragon station, Hull; it will be located in the buffet. This is believed to be the first permanent railway milk bar to be provided at any English station. Its provision is regarded by the L.N.E.R. as an experiment to test the demand there may be for this type of refreshment service.

Central Argentine Wage Cuts.—According to a Reuters message from Buenos Aires, the Central Argentine Railway has announced a wage cut of 3·33 per cent., to be effective from August 1, in consequence of the fall in receipts. The decision is in accordance with the award by General Justo, the former President. It is reported that other lines are to make heavier wage cuts, ranging from 5 to 7 per cent. The arbitral award made by President (as he then was) Justo was accepted over three years ago by the British-owned railway companies and by the employees.

Closing L.M.S.R. Goods Branch in Cumberland.—From Monday last, August 8, the L.M.S.R. Oatlands (Goods) branch, including goods stations at Oatlands and Arlecdon, has been closed for traffic between Distington (Rowrah branch junction) and Rowrah Hall quarry (exclusive). In order to enable traffic from Rowrah Hall quarry to continue to be conveyed to Workington, but *via* Marron junction instead of *via* the Oatlands branch, a new junction is being used at Rowrah, connecting the Cleator & Workington Junction line with the Whitehaven, Cleator & Egremont line.

L.N.E.R. Road Motor Repair Depot, King's Lynn.—The L.N.E.R. has decided to extend the road motor repair depot used for serving the company's road motor vehicles in the King's Lynn district. The depot was opened in October, 1929, to maintain a fleet of 10 to 14 vehicles; this fleet has now increased to 63 motors, 35 trailers, and 5 permanent-way petrol trolleys. The existing accommodation is consequently proving inadequate, and the present scheme provides for doubling the size of the depot in order to enable the maintenance of railway road vehicles to be carried out under the best conditions.

The "Mowatt" Challenge Cup Competition, 1938.—The final cricket match for the challenge cup presented by the late Rt. Hon. Sir Francis Mowatt, G.C.B., was played on the L.N.E.R. (Great Northern Section) Athletic Ground at Gordon Hill, on August 4, when the Mechanical Engineer's team from Doncaster beat the Traffic Departments by 183 runs to 145. The cup was presented to the captain of the winning team by Mr. F. Downes, late Signal and Telegraph Engineer, Southern Area, L.N.E.R.

Day-to-Day Railway Employment in Eire.—The Great Southern Railways Company of Eire has served notice on all staffs, numbering about 12,000, terminating their employment on the terms of their agreement and continuing the employment thereafter on a day-to-day basis of such persons as may be required. The official statement adds: "The company regrets taking this action, which is necessary as a precaution owing to increased costs and reduced receipts." On behalf of the Associated Society of Locomotive Engineers and Firemen, the General Secretary, Mr. W. J. R. Squance, has written to the Great Southern Railways asking for a conference to discuss the notice.

The Paris Holiday Exodus.—About 200,000 French workmen, who are benefiting from the fortnight's paid holiday instituted by the Blum Government in 1936, left Paris last week-end for various parts of France. Among them were 100,000 metal workers. Extra trains were run from all Paris stations and all were crowded with workers, many of them enjoying for the first time the opportunity of seeing the sea and the French countryside. Many factories have been closed for the whole of August. On Tuesday it was announced that all railway passenger traffic records for Paris were broken, as the total of holiday-makers that left the capital in the three days of the week-end was 651,857.

L.M.S.R. Collisions near Motherwell.—As the result of a collision between a stationary goods train and an empty passenger train at Wishaw South station, Lanarkshire, on August 4, the engine of the stationary train was uncoupled by the impact and ran away down the decline of some five miles to Motherwell, where it collided with the rear of a passenger train bound for Glasgow. There were no injuries to passengers, but the driver of the runaway engine was thrown from the cab and received head injuries in the first collision, and the guard of the passenger train involved in the second accident was killed. The Ministry of Transport inquiry was opened in Glasgow on Wednesday.

Belgian Level Crossing Accident.—It is reported from Dunkerque that five Belgians were killed when the motor-car in which they were travelling came into collision with a train at Perroquet. The train carried the car 800 yards. Reuters adds that two months ago there was another accident at the same crossing.

Rayners Lane New Station.—On Monday morning last, August 8, the new London Transport station at Rayners Lane was opened for service. It has cost £31,000, and is in the board's modern style, with the latest ticket selling equipment. Until a few years ago the surrounding country was pasture land, and even when the London Passenger Transport Board came into being Rayners Lane station was a wayside halt. In 1930 some 22,000 passengers used the Rayners Lane station; last year the number was 4,000,000.

Storm Effects in Liverpool.—Railway services were interfered with by the violent thunderstorm which burst over Merseyside on August 6. A large section of a heavy sandstone wall near Broadgreen station, L.M.S.R., was apparently undermined by flood water and fell on to the railway, blocking the local lines between Broadgreen and Lime Street. The fast lines were unaffected. The permanent way at Mersey Road station, Cheshire Lines, was flooded to a depth of several feet, causing a temporary suspension of services to and from Liverpool Central station. Garston was used as the terminus for train services, and for several hours special buses were run between there and Liverpool.

Flood Damage in Cornwall.—A torrential rainstorm on August 4 caused flooding of a portion of the Southern Railway's line near Launceston. Passengers for Launceston and stations further south arriving with the Atlantic Coast Express and succeeding trains were taken to Bude and there transferred to Southern National buses. The Great Western Railway also ran a bus service between Tavistock and Launceston as its line was damaged near Lydford. The Southern Railway's difficulties were intensified by damage on the Great Western Railway between Ivybridge and Newton Abbot, so that the Great Western trains had to be rerouted over the Southern Railway Plymouth–Okehampton–Exeter line.

New Paris-Bucharest Route for Simplon-Orient Express.—At the end of the year the Paris-Bucharest through coaches of the Simplon-Orient express will travel forward from Vinkovci *via* Belgrade and Pancevo (using the new bridge across the Danube described in our issue of December 27, 1935), cutting out the present detour *via* Subotica on the Hungarian frontier. The train will thus enter Roumania direct from Jugoslavia, instead of passing through Hungary. To take the

heavy traffic involved by this change, which will save several hours on the journey, the 45 miles of railway from Pancevo to the Jugoslav-Roumanian frontier at Vershetz will be relaid.

Argentine Railway Earnings.—According to the statistical summary published in Buenos Aires by the Instituto de Estudios Económicos del Transporte, the gross receipts of the privately owned railways in Argentina, for the ten months from July, 1937, to April, 1938, inclusive, amounted to 340,315,000 pesos, compared with 386,576,000 pesos for the corresponding period of the previous financial year. The decrease of 46,261,000 pesos, or 12 per cent., was accounted for by a fall of over 17 per cent. in goods traffic, only partly offset by a rise of 4·3 per cent. in passenger receipts.

Midland Uruguay Railway Debenture Stock.—A draft supplemental trust deed has been approved by the holders of the five per cent. debenture stock of the Midland Uruguay Railway Company, between the company and Lord Farrer, the trustee. The reason for the new deed is to clear up the doubt as to whether the supplemental trust deed of July, 1927, included the annual charge for the sinking fund of the stock. At the same time the appointment was approved of the London Maritime Investment Company, as trustee in place of the late Viscount St. Davids.

Uruguay Northern Railway Moratorium.—An extension of the moratorium scheme is proposed by the Uruguay Northern Railway Company, on the £49,000 5 per cent. prior lien debenture stock. Under the old scheme, arrears of interest due since August 1, 1935, and a further half-year's instalment are now payable. In agreement with the stockholders' committee, it has been agreed to pay 2½ per cent., that is, interest to August 1, 1935, and debenture holders are asked to postpone payment of the remaining arrears and to extend the period of the moratorium to cover the following four years.

British and Irish Traffic Returns

GREAT BRITAIN	Totals for 31st Week			Totals to Date		
	1938	1937	Inc. or Dec.	1938	1937	Inc. or Dec.
	£	£	£	£	£	£
L.M.S.R. (6,834¾ mls.)						
Passenger-train traffic...	784,000	812,000	– 28,000	16,189,000	16,182,000	+ 7,000
Merchandise, &c. ...	286,000	360,000	– 74,000	14,069,000	15,073,000	– 1,004,000
Coal and coke ...	141,000	157,000	– 16,000	7,723,000	7,909,000	– 186,000
Goods-train traffic ...	427,000	517,000	– 90,000	21,792,000	22,982,000	– 1,190,000
Total receipts	1,211,000	1,329,000	– 118,000	37,981,000	39,164,000	– 1,183,000
L.N.E.R. (6,315 mls.)						
Passenger-train traffic...	544,000	531,000	+ 13,000	10,408,000	10,514,000	– 106,000
Merchandise, &c. ...	229,000	246,000	– 17,000	9,814,000	10,404,000	– 590,000
Coal and coke ...	155,000	186,000	– 31,000	7,332,000	7,607,000	– 275,000
Goods-train traffic ...	384,000	432,000	– 48,000	17,146,000	18,011,000	– 865,000
Total receipts	928,000	963,000	– 35,000	27,554,000	28,525,000	– 971,000
G.W.R. (3,737 mls.)						
Passenger-train traffic...	365,000	382,000	– 17,000	6,758,000	6,821,000	– 63,000
Merchandise, &c. ...	109,000	138,000	– 29,000	5,731,000	6,085,000	– 354,000
Coal and coke ...	42,000	60,000	– 18,000	3,324,000	3,443,000	– 119,000
Goods-train traffic ...	151,000	198,000	– 47,000	9,055,000	9,528,000	– 473,000
Total receipts	516,000	580,000	– 64,000	15,813,000	16,349,000	– 536,000
S.R. (2,148 mls.)						
Passenger-train traffic...	500,000	523,000	– 23,000	10,121,000	10,180,000	– 59,000
Merchandise, &c. ...	41,000	42,500	– 1,500	1,852,500	1,916,500	– 64,000
Coal and coke ...	14,000	12,500	+ 1,500	925,500	945,500	– 20,000
Goods-train traffic ...	55,000	55,000	—	2,778,000	2,862,000	– 84,000
Total receipts	555,000	578,000	– 23,000	12,899,000	13,042,000	– 143,000
Liverpool Overhead ... (6½ mls.)	1,762	1,745	+ 17	42,653	40,099	+ 2,554
Mersey (4½ mls.) ...	5,571	5,118	+ 453	135,773	130,240	+ 5,533
*London Passenger Transport Board ...	563,000	563,600	– 600	3,418,300	3,384,200	+ 34,100
IRELAND						
Belfast & C.D. pass. (80 mls.)	5,036	5,659	– 623	77,479	81,284	– 3,805
,, ,, goods	436	450	– 14	13,235	15,302	– 2,067
,, ,, total	5,472	6,109	– 637	90,714	96,586	– 5,872
Great Northern pass. (543 mls.)	23,950	24,100	– 150	327,800	333,450	– 5,650
,, ,, goods	7,700	8,050	– 350	271,650	292,600	– 20,950
,, ,, total	31,650	32,150	– 500	599,450	626,050	– 26,600
Great Southern pass. (2,076 mls.)	74,452	73,942	+ 510	1,092,332	1,088,060	+ 4,272
,, ,, goods	32,000	30,983	+ 1,017	1,198,683	1,256,037	– 57,354
,, ,, total	106,452	104,925	+ 1,527	2,291,015	2,344,097	– 53,082

August Bank Holiday week, 1938 and 1937 * 6th Week (before pooling)

British and Irish Railway Stocks and Shares

Stocks	Highest 1937	Lowest 1937	Prices Aug. 10, 1938	Prices Rise/Fall
G.W.R.				
Cons. Ord. ...	67⅜	55¾	38	–1
5% Con. Prefce. ...	127	108	100½*	–2
5% Red. Pref. (1950)	113	109	102½*	–4
4% Deb.	113⅝	102½	106½	–½
4½% Deb. ...	118	106	108½	–1
4½% Deb.	124½	112	113½	–1
5% Deb.	136½	122¾	127½	–1
2½% Deb. ...	76	64	66½	—
5% Rt. Charge ...	133 7/16	118	120½	–4
5% Cons. Guar. ...	133¾	116½	115½*	–6
L.M.S.R.				
Ord.	36⅛	25⅜	13½	–1
4% Prefce. (1923)	82½	65¾	30½	–4
4% Prefce. ...	92½	77¾	56½*	–5
5% Red. Pref. (1955)	107¾	102	80½	—
4% Deb.	108	99¼	101	+½
5% Red. Deb. (1952)	117½	111	112½	—
4% Guar. ...	104	95⅞	88½*	–5
L.N.E.R.				
5% Pref. Ord. ...	12½	6¾	4¼	—
Def. Ord.	6¼	3⅝	2½	—
4% First Prefce.	79½	63	26½	–6
4% Second Prefce.	31½	21	10½	–½
5% Red. Pref. (1955)	101¼	89¾	49½	–8
4% First Guar. ...	103	91⅞	79*	–3½
4% Second Guar.	97⅝	85½	64½*	–5
3% Deb.	84⅛	74	72½	–1
4% Deb.	107¼	98½	98½	–½
5% Red. Deb. (1947)	113½	106½	109½	—
4½% Sinking Fund Red. Deb.	110 5/16	105½	107	—
SOUTHERN				
Pref. Ord.... ...	98⅝	83½	56½*	–4
Def. Ord.	27⅞	16¾	13¾	–¾
5% Pref.	126 1/16	105 13/16	99½*	–2
5% Red. Pref. (1964)	118	110¼	109*	–3
5% Guar. Prefce.	133¾	116¾	117½*	–6
5% Red. Guar. Pref. (1957)	118½	111½	113½*	–1½
4% Deb.	112	101¼	105½	—
5% Deb.	135¾	123½	126½	—
4% Red. Deb. 1962–67	113	105	106½	—
BELFAST & C.D.				
Ord.	5	4	4	—
FORTH BRIDGE				
4% Deb.	106	99½	100½	—
4% Guar. ...	105¾	99	99½	—
G. NORTHERN (IRELAND)				
Ord.	11	5	3	–½
G. SOUTHERN (IRELAND)				
Ord.	50	21½	20	—
Prefce.	61	34	13½	–½
Guar.	94¾	69½	40	–2
Deb.	95	82⅛	70	—
L.P.T.B.				
4½% "A" ...	123¾	110½	118½	—
5% "A" ...	135	121½	128½	—
4½% "T.F.A." ...	108¾	104	106	—
5% "B" ...	125	114½	119½	—
"C"	99¾	75	74	—
MERSEY				
Ord.	42⅜	22	17	—
4% Perp. Deb. ...	103	96¾	99	—
3% Perp. Deb. ...	77⅝	74½	73½	—
3% Perp. Prefce.	68¾	61¼	65	—

* ex dividend

CONTRACTS AND TENDERS

The Metropolitan-Vickers Electrical Co. Ltd. has received a £37,000 contract from the London Passenger Transport Board for the supply of motor-generators and switchgear for installation in 21 substations under construction—10 on the Northern and 11 on the North-East London tube extensions.

Diesel Shunters for L.M.S.R.

The English Electric Co. Ltd. has received an order from the L.M.S.R. for 20 complete power-transmission equipments for 350-400 b.h.p. diesel-electric shunting locomotives with a single motor and jackshaft drive. The mechanical portions of these locomotives are to be built at L.M.S.R. works. There are already 11 English Electric diesel shunting locomotives on the L.M.S.R., and they have given great satisfaction.

Heatly & Gresham Limited has received orders from the Indian Stores Department for a total of 9,600 smoke tubes and 100 superheater flue tubes.

Usines & Boulonneries Hermant Hickguet has received an order from the Egyptian State Railways Administration for 1,200 metric tons of screw spikes (Ref. No. ESR. 302.G.3/18B).

The Tees Side Bridge & Engineering Co. Ltd. has received an order from the Bengal-Nagpur Railway Administration for 1,200 drawbar hooks and 1,200 drawbar ends.

The Turkish State Railways have placed an order in Germany for six diesel-mechanical train sets. Each train unit will be equipped with two M.A.N. 420-b.h.p. oil engines and Mylius five-speed gearboxes.

New Engineering Shops and Locomotive Depot for Ipswich, L.N.E.R.

The L.N.E.R. announces that it has been decided to modernise the locomotive depot at Halifax junction, Ipswich. At the same time, new workshops and stores for the Permanent Way Engineering Department are to be erected adjoining the existing permanent way layout ground at London Road. This will involve demolishing the existing engineers' workshops at Halifax junction and the space so rendered available will be incorporated in the locomotive depot. The improvements to the locomotive depot at Halifax Junction comprise a new engine shed having six sets of rails running through it, a mechanical coaling plant with a bunker of 250 tons capacity, a mechanically-operated articulated turntable, 70 ft. dia., together with up-to-date equipment in the matter of ash-pits, hot water wash-out plant, wheel-drops, preparation pits, and water tanks. The whole of the machinery in the machine shop will be converted from steam to electrically driven, and additional electric lighting will be installed in the depot. When these alterations are complete, it will be one of the most up to date on the L.N.E.R. The new engineering depot at London Road will also be driven electrically and will result in improved methods of permanent way maintenance being introduced. Work on the scheme is to begin at once and the total cost is in the region of £76,000.

D. Wickham & Co. Ltd., has received an order from the Chemin de fer du Bas-Congo au Katanga for two 3-ft. 6-in. gauge petrol-engined railcars, each of which will have two Ford V8 engines and Mylius four-speed gearboxes.

The Crown Agents for the Colonies have recently placed the following orders :—

Metropolitan-Vickers Electrical Co. Ltd.: Switchgear.
Ericsson Telephones Limited: Telephone apparatus.
General Electric Co. Ltd.: Telephones.
Associated British Machine Tool Makers Limited: Universal milling machines.
W. & T. Avery Limited: Weighing machines.
A.I. Electric Welding Appliances Company: Welding machine.

The Gloucester Railway Carriage & Wagon Co. Ltd. has received an order from the Crown Agents for the Colonies for two caboose vans complete for the Nigerian Railway.

The Incandescent Heat Co. Ltd. has received an order from the Bombay, Baroda & Central India Railway Administration for one oil-fired normalising furnace complete to be supplied to the inspection of Messrs. Rendel, Palmer & Tritton.

Modernisation of L.N.E.R. Refreshment Rooms in East Anglia

The L.N.E.R. is to carry out schemes of modernisation in the refreshment rooms at Cambridge, Ely, March, and Boston stations. It is intended to modernise the equipment, and by bringing it into line with present-day demands to make these refreshment rooms more attractive and comfortable for the travelling public.

In connection with the increased number of electric restaurant cars in service in East Anglia the L.N.E.R. has decided to instal additional electrical charging points at Liverpool Street, Stratford, Ipswich, and to re-position four existing electric pre-heating points at Parkeston Quay to provide current for restaurant cars standing in the sidings or waiting to commence their journey.

The South African Railways & Harbours Administration is calling for tenders (Tender No. 1818) for the supply and delivery of quantities of copper plates for locomotive boilers. Tenders endorsed "Tender No. 1818—Copper Plates for Locomotive Boilers" should reach the Secretary to the Tender Board, Room 197, South African Railways & Harbours Headquarter Offices, Johannesburg, by September 12. A copy of the schedule of requirements, specification, and conditions of tender may be borrowed from the Department of Overseas Trade. Local representation is essential, and the D.O.T. is prepared to furnish firms desirous of tendering for the supply of copper plates of United Kingdom manufacture, and not represented in South Africa, with the names of United Kingdom merchant houses with local connections who may be willing to handle tenders on their behalf.

In view of the great increase in the passenger business at Walton-on-Naze and the consequential increased working of larger locomotives to that point, the L.N.E.R. has decided to replace the engine turntable at Walton-on-Naze station. The present turntable is only 45½-ft. dia. and is proving too small for the larger locomotives required to haul trains to and from Walton. It is to be replaced by a 55-ft. turntable which will be able to accommodate the larger engines now in use.

Diesel-engined Train Sets required for New Zealand

With reference to the New Zealand Government Railways' enquiry for the supply of diesel-engined train sets, the following information is to be added to the specification :—"These sets will be required to run on 55-lb. track, and, in view of this, the limit of weight under any one pair of wheels must be within a maximum of nine tons with a loaded train." In view of the addition to the specification, it has been decided to extend the period for the receipt of tenders, and the closing date will now be October 3, 1938.

Tenders are invited by the Chief Controller of Stores, Indian Stores Department (Hardware Section), Simla, receivable by September 5, for the supply of track tools, including beaters, shovels, and rakes required for the State Railways during the period December 16, 1938, to December 15, 1939.

Tenders are invited by the Chief Controller of Stores, Indian Stores Department (Hardware Section), Simla, receivable by September 12, for the supply of hand and small tools including hammers, augers, braces, drills, and spanners, for the State Railways, during the period December 16, 1938, to December 15, 1939.

S.R. Buffet Car Plaques and the Renu Plating Co. Ltd.

With reference to the above plaques, which were illustrated on page 164 of the July 22 issue of THE RAILWAY GAZETTE, we have been asked to mention that their reproduction was carried out by the Renu Plating Co. Ltd., 27/31, Upper Ground, Blackfriars, S.E.1.

INSTITUTION OF CIVIL ENGINEERS.—The Council of the Institution of Civil Engineers has recently decided that, with a view to avoiding the duplication of examinations, corporate members of the Institute of Marine Engineers who have qualified, in or after the year 1936, by examination in the requisite subjects of Sections A and B of the associate membership examination of that institute will be entitled to exemption from the whole of Section B of the associate membership examination of the Institution of Civil Engineers.

OFFICIAL NOTICES

REQUIRED for Railway Workshops in Brazil, Production Engineer with expert knowledge of modern machine shop methods, capable of instructing local workmen in efficient operation of their machines. Should be experienced in maintenance of Locomotives and Rolling Stock and able to fix piecework rates. Salary about £500 per annum on agreement according to attainments, free passage, &c. Age about 25. Write giving details of training and experience, age, single or married, and copies of testimonials to: "G.B.," c/o STREETS, 6, Gracechurch Street, London, E.C.3.

OFFICIAL ADVERTISEMENTS intended for insertion on this page should be sent in as early in the week as possible. The latest time for receiving official advertisements for this page for the current week's issue is noon on Thursday. All advertisements should be addressed to:—*The Railway Gazette*, 33, Tothill Street, Westminster, London, S.W.1.

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RAILWAY AND OTHER REPORTS

Mumbles Railway & Pier Company.—For the half-year ended December 31, 1937, a distribution of 4 per cent. is being made on the preference shares, and 7 per cent. on the ordinary shares.

Swansea & Mumbles Railways Limited.—The dividends which are being paid in respect of the half-year ended December 31, 1937, are 4¼ per cent. on the preference shares, and 8¾ per cent. on the ordinary shares.

Great Southern Railways Company.—The directors of the Great Southern Railways Company (Eire) at their meeting on August 5 had the accounts before them for the half-year ended June 30, 1938, and regret that no interim dividends on the 4 per cent. guaranteed preference or on the preference or ordinary stocks of the company are available.

Ottoman Railway Holding Co. Ltd.—A net profit of £41,334 is shown in the preliminary statement for the year ended June 30, 1938, an increase of £10,931 over the previous year's figure. With the £2,543 brought forward, the total available for interest on, and redemption of, the "A" and "B" income debenture stocks is £43,877, as against £32,072. It is proposed to pay interest at the maximum rate of 3 per cent., less tax, on the "A" and "B" stocks. This compares with 2½ per cent., less tax, for the previous year and 2¼ per cent. actual for the initial nine months to June 30, 1936. This will require £33,590, and the balance of £10,287 will be applied towards the redemption of "A" and "B" stocks *pari passu*. The balance of £2,543 last year, after interest payment, was carried forward.

Grand Union Canal Company.—The directors have decided not to pay an interim dividend on the 6 per cent. non-cumulative preference stock, or on the capital stock, for the half-year ended June 30, 1938. No dividend was paid last year.

International Railways of Central America.—The directors have declared a dividend of $1·25 a share on the five per cent. cumulative preferred stock, payable on August 15. This brings the payments up to May 15, 1933. No dividend has yet been paid on the company's no-par-value common stock.

Further Sörlands Railway Opening

This section of the Norwegian State Railways is now completed as far as Kristiansand

On June 21 last a further section of the Sörlands line of the Norwegian State Railways was opened for traffic, comprising the newly-built portion between Nelaug and Grovane, and the converted narrow-gauge section thence to Kristiansand. The Sörlands line is the main connecting route from Oslo to Drammen, Kristiansand and Stavanger, joining the southern and south-western parts of the country with the eastern parts and the capital. Its first portion, the Oslo—Drammen line was opened as long ago as 1872, and about ten years later the Drammen—Skien line was completed. In the years immediately following opinions were much divided as to the best route to follow, some favouring a line along the coast. Economic conditions led to a suspension of railway activity, but when the subject was taken up again in the nineties it was thought better in the first instance to make lines connecting the coast towns with the districts behind which traded with them, rather than build a through route. The result was a number of narrow gauge lines, such as those from Kristiansand to Byglandsfjord; Arendal to Treungen; Brevik to Eidanger; and, further west, Egersund to Flekkefjord.

The year 1908 saw the beginning of a definite plan for a Sörlands line, proposals being put before Parliament to construct one from Kongsberg through Hjuksebö and Lunde to Neslandsvatn, and westwards from there *via* Grovane and Flekkefjord to Stavanger. Parliament sanctioned the work between Kongsberg and Neslandsvatn with a branch to Kragerö. A route inland rather than along the coast was chosen for military reasons. Not until 1923 was it decided to proceed with the rest of the line, which was brought into use in sections as opportunity arose. From Kongsberg to Hjuksebö was opened in 1920, and the portion from Nordagutu to Neslandsvatn, with the Kragerö branch, in 1927. The piece between Hjuksebö and Nordagutu was also made in 1920, as part of a line from Notodden to Skien to serve the Norwegian hydro-power undertaking. The extension from Neslandsvatn to Nelaug was opened in 1935, connecting with the existing lines to Arendal and Grimstad, and on June 21 this year the line reached Kristiansand, the portion from Grovane onwards being converted to standard gauge. Originally, the Oslo to Drammen and Kongsberg lines were narrow gauge, but were converted many years ago.

The shortest radius on curves on the Sörland route is 300 m. (328 yd.), the maximum gradient 1·8 per cent., and the rails weigh 35 kg. per metre (71·5 lb. per yd.). Curves of 180 m. (197 yd.) are found on the branches, however. There are no special engineering works on the portion recently opened. The importance of the line lies in the connection now given from Kristiansand to the main State Railways system. It passes through very thinly populated districts of no great tourist value. From Grovane to Kristiansand, where the old narrow gauge section ran, there are more people.

The highest point on the new piece of line is 283 m. (929 ft.) above sea level. Two-thirds of the track are curved. There are 17 tunnels, the longest of 374 m. (409 yd.), covering 2 km. (1¼ miles) in all; and 19 bridges, the longest of 159 m. (174 yd.). Construction work was not very easy, special measures being required to accommodate the workmen. The cost of the new portion, with rolling stock, is put at 26,700,000 Kroner, and for the converted section at 10,500,000. Total cost has worked out at 444,000 Kr. per km. for the whole route from Kongsberg, 266 km. (165¼ miles); there is not much prospect that the line can in itself be a paying concern, at least not for a considerable time. The run from Oslo to Kristiansand, 365 km. (227 miles) takes 8 hours by day and 7 to 7½ hours at night. Kristiansand station has been rebuilt and enlarged, with new goods shed, restaurant, central heating, and new light installation.

XUM

Railway Share Market

Despite the beginning of a new stock exchange account, the stock and share markets have remained dull, and prices in most sections were slightly lower. As the volume of business continued at a low ebb, the tendency was for only a moderate amount of selling to have a disproportionate influence on the prices of individual securities. At the beginning of the week Home railway stocks developed a steadier trend and made slightly better prices, but later they reacted following publication of the traffic figures for the past week. Despite the fact that last week included Bank Holiday Monday, passenger receipts were disappointing, and aggregate traffics for the week record a decrease of £240,000. In the case of the L.M.S.R. the decrease is £118,000 and the Southern, which it was hoped would have been able to show a moderate increase owing to better passenger takings, reports a decrease of £23,000. The Great Western's return for the past week shows a decline of £64,000. That for the L.N.E.R. is £35,000, which, however, was rather smaller than expected.

L.M.S.R. 1923 preference reacted to 31, and the 4 per cent. preference to 57, while the ordinary stock fluctuated moderately around 14¼, as did Southern deferred. Southern preferred improved fractionally to 57, but subsequently came back to 56½ ex dividend. The 5 per cent. guaranteed stock reacted two points to 116½. Great Western ordinary fluctuated rather sharply at times, and after declining to 38½ improved to 40½, but later reacted to 39⅞. Reduced prices have been made by this railway's 4 per cent. debentures at 106½, and also by the 5 per cent. guaranteed and 5 per cent. preference stocks at 115½ and 100½ respectively, but very little selling was reported. The lower prices reflect the fear that the directors are not prepared to draw on reserves in order to pay a dividend of 3 per cent. on the ordinary stock, and that the prior charges may, therefore, lose their full trustee status. L.N.E.R. second preference has been dull around 10½, as has the first preference around 27½. The 4 per cent. first and 4 per cent. second guaranteed stocks, which are both ex-dividend, have moved down to 78½ and 64½ respectively. In most cases guaranteed and preference stocks appear to have been lowered unduly in price, and they no doubt have scope for an improvement of several points in active markets, assuming the traffics develop a better trend. London Transport "C" has reacted moderately to 74 in sympathy with the general tendency this week.

There was a better undertone in Argentine railway securities, but movements in prices were small. Central Argentine at 8¼ was fractionally higher than earlier in the week owing to the decision to reduce wages as a result of the fall in receipts. B.A. Gt. Southern was steadier at 12¼, as was B.A. Western ordinary at 7⅞, and various of the preference stocks were also a better market. Elsewhere Antofagasta was active but at 12 has not held best prices. Cordoba Central debentures received attention on the belief that the Bill for the purchase of the line will be sanctioned shortly. American railway stocks fluctuated. Canadian Pacific transferred at slightly under $7.

Traffic Table of Overseas and Foreign Railways Publishing Weekly Returns

	Railways	Miles open 1937 38	Week Ending	Traffics for Week: Total this year	Traffics for Week: Inc. or Dec. compared with 1937	No. of Weeks	Aggregate Traffics to Date: Totals: This Year	Aggregate Traffics to Date: Totals: Last Year	Aggregate Traffics to Date: Increase or Decrease	Shares or Stock	Prices: Highest 1937	Prices: Lowest 1937	Prices: Aug. 10, 1938	Prices: Yield (See Note)
				£	£		£	£	£					
South & Central America	Antofagasta (Chili) & Bolivia	834	7 8.38	9,580	– 4,190	32	482,990	517,890	– 34,900	Ord. Stk.	29	10¼	12½	Nil
	Argentine North Eastern	753	6.8.38	12,649	+ 2,134	6	62,531	56,210	+ 6,321	„	19¼	6	6	Nil
	Argentine Transandine	—	—	—	—	—	—	—	—	A. Deb.	93½	60	80	5
	Bolivar	174	July, 1938	3,650	– 2,150	30	26,250	40,800	– 14,550	6 p.c. Deb.	9½	5	8½	Nil
	Brazil	—	—	—	—	—	—	—	—	Bonds.	17	9	6	85/16
	Buenos Ayres & Pacific	2,806	6.8.38	75,993	– 6,017	6	390,820	447,209	– 56,389	Ord. Stk.	17⅛	5½	5	Nil
	Buenos Ayres Central	190	23.7.38	$111,500	– $54,000	4	$405,200	$541,300	– $136,100	Mt. Deb.	41½	18	14	Nil
	Buenos Ayres Gt. Southern	5,084	6.8.38	122,581	– 2,109	6	663,028	662,345	+ 683	Ord. Stk.	33¾	13½	12½	Nil
	Buenos Ayres Western	1,930	6.8.38	35,422	– 5,707	6	201,922	242 680	– 40,758	„	31¾	11¼	8½	Nil
	Central Argentine	3,700	6.8.38	102,993	– 23,440	6	549,771	796,243	– 246,472	„	34¼	10¾	8½	Nil
	Do.	—	—	—	—	—	—	—	—	Did.	20½	4½	4½	Nil
	Cent. Uruguay of M. Video	972	30.7.38	16,092	– 20	5	72,941	69,255	+ 3,686	Ord. Stk.	6732	2	2	Nil
	Cordoba Central	1,218	—	—	—	—	—	—	—	Ord. Inc.	6¼	1½	3½	Nil
	Costa Rica	158	June, 1938	31,369	+ 318	52	314,399	249,333	+ 65,066	Stk.	38	27	25½	713/16
	Dorada	70	June, 1938	16,500	+ 2,500	23	95,700	90,400	+ 5,300	1 Mt. Db.	107	106	105	511/16
	Entre Rios	810	6.8.38	17,339	+ 2,916	6	83,777	77,022	+ 6,755	Ord. Stk.	19716	6	6	Nil
	Great Western of Brazil	1,092	6.8.38	4,500	– 2,000	32	206,200	231,200	– 25,000	Ord. Sh.	5¼	1⅛	1¼	Nil
	International of Cl. Amer.	794	June, 1938	$425,611	+ $9,637	26	$3,010,489	$3,126,388	– $115,899	—	—	—	—	—
	Interoceanic of Mexico	—	—	—	—	—	—	—	—	1st Pref.	2/-	1/-	1½	Nil
	La Guaira & Caracas	22§	July, 1938	5,345	+ 930	31	35,580	38,120	– 2,540	Stk.	8½	6	8½	Nil
	Leopoldina	1,918	6.8.38	23,896	– 1,022	32	593,723	709.431	– 115,708	Ord. Stk.	9¼	3	2	Nil
	Mexican	483	31.7.38	$380,200	– $81,600	5	$1,198,900	$1,292,100	– $93,200	„	1½	1⅛	5/16	Nil
	Midland of Uruguay	319	June, 1938	7,400	– 2,097	52	111,899	105,718	+ 6,181	„	1⅞	1½	1½	Nil
	Nitrate	386	31.7.38	5,209	– 404	31	90,505	95,366	– 4,361	Ord. Sh.	3116	2	2	5
	Paraguay Central	274	30.7.38	$3 344,000	+ $110,000	5	$14,782,000	$16,522,000	– $1,740,000	Pr. Li. Stk.	84	79¼	57½	5316
	Peruvian Corporation	1,059	July, 1938	74,055	– 7.079	5	74,055	81,134	– 7,079	Pref.	14⅝	4½	3¼	Nil
	Salvador	100	30.7.38	¢12,434	– ¢236	5	¢48,623	¢54,652	– ¢6,029	Pr. Li. Db.	23½	21½	22½	Nil
	San Paulo	153½	31.7.38	31,500	– 883	31	959,557	998,561	– 39,004	Ord. Stk.	98½	56	40	10
	Taltal	160	July, 1938	3,510	+ 570	4	3,510	2,940	+ 570	Ord. Sh.	1716	1116	5¼	13616
	United of Havana	1,353	6.8.38	18,885	+ 848	6	86,214	102,013	– 15,799	Ord. Stk.	56⅜	31⅜	11⅜	Nil
	Uruguay Northern	73	June, 1938	909	+ 76	52	11,259	11,689	– 430	Deb. Stk.	10	2	2	Nil
Canada	Canadian National	23,781	31.7.38	946,586	– 189,561	31	19,387,255	22,331,859	– 2,944,604	—	—	—	—	—
	Canadian Northern	—	—	—	—	—	—	—	—	4 p.c.	—	—	—	—
	Grand Trunk	—	—	—	—	—	—	—	—	Perp. Dbs.	77	62½	63½	615/16
	Canadian Pacific	17,186	31.7.38	750,000	– 58,400	31	14,475,600	15,766,400	– 1,290,800	4 p.c. Gar.	101⅞	94½	102½	3⅜
										Ord. Stk.	18	7¼	7	Nil
India†	Assam Bengal	1,329	20.7.38	40,207	+ 5,458	16	417,393	394.343	+ 23.050	Ord. Stk.	86	73½	78	3151/6
	Barsi Light	202	20.7.38	3,157*	– 10,305	16	52,470	46,500	+ 5,970	Ord. Sh.	66½	46	60	8516
	Bengal & North Western	2,116	20.7.38	66,043	– 11,307	16	933,227	979,848	– 46,621	Ord. Stk.	317	301	288½	614
	Bengal Dooars & Extension	161	20.7.38	3,828	– 1,284	16	39,076	39,000	+ 76	„	100	84	85½	7
	Bengal-Nagpur	3,268	20.7.38	155,325	– 26,538	16	2,185,037	2,228.828	– 43.761	„	101	89	92	4⅜
	Bombay, Baroda & Cl. India	3,085	31.7.38	211,650	+ 10,725	18	3,025.050	3,087,000	– 61,950	„	113	110½	110½	5716
	Madras & Southern Mahratta	2,967	20.7.38	145,275	+ 15,527	16	1,808,073	1,708.547	+ 99,526	„	110	105	107	8716
	Rohilkund & Kumaon	546	20.7.38	11,454	– 1,519	16	187,474	193,254	– 5,780	„	314	302	297½	6116
	South Indian	2,531½	20.7.38	114,470	+ 3,099	16	1,301,705	1,291,012	+ 10,693	„	103½	99½	101½	411/16
Various	Beira-Umtali	204	May, 1938	84,595	+ 434	35	693,281	585,391	+ 107,890	—	—	—	—	—
	Egyptian Delta	620	20.7.38	5,558	– 417	16	60,474	64,240	– 3,766	Prf. Sh.	31/-	5¼	5¼	Nil
	Kenya & Uganda	1,625	June, 1938	216,938	+ 28,675	26	1,498,289	1,524,339	– 26,050	—	—	—	—	—
	Manila	—	—	—	—	—	—	—	—	B. Deb	48⅛	43½	43	8⅛
	Midland of W. Australia	277	June, 1938	15,962	+ 4,994	52	180,120	155,207	+ 24,913	Inc. Deb.	98	93½	93½	414
	Nigerian	1,900	2.7.38	28,714	– 8,045	14	407,837	754,205	– 346,368	—	—	—	—	-
	Rhodesia	2,442	May, 1938	411,404	– 285	35	3,317,856	2,932,177	+ 385,679	—	—	—	—	-
	South Africa	13,263	30.7.38	624,507	– 28,741	18	10,620,941	10,853,287	– 232,346	—	—	—	—	—
	Victoria	4,774	May, 1938	849,379	+ 26,441	48	9,015,865	9,342,068	– 326,203	—	—	—	—	—

NOTE.—Yields are based on the approximate current prices and are within a fraction of 1/16

* Ashadi fair. † Receipts are calculated @ 1s. 6d. to the rupee § ex dividend.

The variation in Sterling value of the Argentine paper peso has lately been so great that the method of converting the Sterling weekly receipts at the par rate of exchange has proved misleading, the amount being overestimated. The statements are based on the current rates of exchange and not on the par value.